TELEPHONE ENGINEER

Vol. VI CHICAGO, AUGUST, 1911 No. 2

INERTIA (in the business world) means "disinclination to change in methods." If you're talking of your own Company, you call it "conservation," but if you're talking of the other fellow's Company, it's "slowness."

Was the man who took ten years to adopt hard drawn copper "slow" or "conservative?"

Hundreds of people in this country are saving thousands of dollars by the use of Copper Clad Steel Wire.

How much is *your* "inertia" costing *you?*

Trade Mark

"Weld-Clad"

Duplex Metals Company

Main Office and Works:
CHESTER, PENNSYLVANIA

Singer Building
NEW YORK

Monadnock Block
CHICAGO

LIBRARY OF CONGRESS AUG 2 1911 PERIODICAL DIV.

KERITE

Unimpaired By Thirty-Two Years' Service

The Kerite Twelve Conductor Cable, a section of which is illustrated above, was placed in service in 1879 and it is giving perfect service today, 1911.

DAYS KERITE

KERITE INSULATED WIRE AND CABLE COMPANY

Incorporated by W. R. Brixey

General Offices

Hudson Terminal, 30 Church Street, New York

Western Office

Peoples Gas Building, Chicago

80-2057

The Moral Effect

of The Calculagraph in a telephone exchange will be worth all the machine costs. Timing toll messages with a visible clock dial and pencil or with a time-of-day stamp is a very uncertain and careless method of measuring charges and toll revenue. It breeds carelessness in other matters of operating.

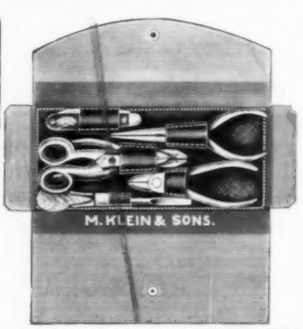
THE CALCULAGRAPH

records *elapsed time* — the exact number of minutes and quarter minutes a toll line is in use; mistakes are impossible. It sets a high standard of efficiency for operators to work up to and increases revenue.

Calculagraph Company

1456 Jewelers Bldg. **New York City**

A tool in the pocket is worth ten in the chest.



KLEIN'S Electrician's Pocket Kit

is a durable, compact, genuine leather case containing 5″ side cutting pliers, 6″ long nose side cutting pliers, 5″ oblique pliers, all KLEIN make; also screw driver, electrician's knife and nickel-plated snips. Can be depended upon for reliable service.

Write for catalog 7E covering Linemen's tools.

Mathias Klein & Sons

Station U 20 **CHICAGO, ILL.**

Telephone Engineer

WITH WHICH IS CONSOLIDATED THE WESTERN TELEPHONE JOURNAL
ESTABLISHED 1902

Published Monthly by the

ELECTRICITY MAGAZINE CORPORATION
MONADNOCK BUILDING, CHICAGO
Long Distance Telephone: Harrison 3014

Ed J. Mock and Paul H. Woodruff, Editors — James B. Crippen, Associate Editor
Allen L. Haase, Advertising Representative

New York Office, 1433 Hartford Bldg., 41 Union Square
LAURENCE F. COOK, Eastern Representative
Telephone: Stuyvesant 1672

London Office: 86 Maiden Lane, Covent Garden
S. RENTELL & CO., Representatives

This publication is free and independent of all business or house connections or control. No telephone company, manufacturer or supply dealer, or their stockholders or representatives have any financial interest in TELEPHONE ENGINEER *or any voice in its management or policy.*

Table of Contents

Convention of the Superintendents to Railway Telegraph ..... *Frontispiece*
Editorial 63-66
- How Manay Telephone Companies? 63
- American Service in British Eyes 63
- Electric Waves Guided by Wires 65
- The Telephone Report Mania 66

Why Subscribers Lose Calls. By J. W. Hepner 67-69
Multiplex Telephony and Telegraphy. By Major George O. Squier 69-73
Exclusive Contracts Upheld in Missouri 73
Commission Notes from Washington 73
What One Woman Thinks. By Sarah Elizabeth Brown 74-75
Michigan Men Discuss Giles Law 75
Demonstration of Submarine Telephone 75
Digest of Foreign Telephone Literature 76-78
Indiana's Telephones 78
The Telephone Scrap Book 79-82
Who's Who in the Telephone Game 83-84
A. I. E. E. Convenes in Chicago 84
The Law and the Telephone. By E. J. Wenner 85-86
Department of Railway Telephones 87-93
Recent Telephone Patents. By David S. Hulfish 93-94
Of Interest to the Trade. By A. L. Haase 95-100
- An Interesting Pay Station 95
- Book Review 95
- "Peerless" Personified 95
- Two New Uses for the Telephone 96
- A Moisture-Proof Dry Battery 97
- Wayside Service in California 98
- Opportunity for Export Trade 99

Brevities of the Business 100-108

TERMS OF SUBSCRIPTION

United States, Cuba and Mexico, - - - Per year, $2.00 — Foreign countries within the Postal Union, - Per year, $3.00
Canada, - - - - - - - - - - Per year, 2.50 — Single Copy, - - - - - - - - - - - - .20

NOTICE TO ADVERTISERS

Changes of advertising copy should reach the office of publication not less than ten days in advance of date of issue. Regular date of issue, the first day of each month. New advertisements will be accepted up to within five days of date of issue, but proof of such advertisements cannot be shown in advance of publication.

NOTICE TO SUBSCRIBERS

REMITTANCES—Remittances should be made by check, New York draft or money order, in favor of Telephone Engineer. Foreign subscriptions may be remitted direct by International Postal Money Order, or sent to our London office.

CHANGE OF ADDRESS—The old address should be given as well as the new, and notice should be received two weeks in advance of the desired change.

CLUB RATE—In acknowledgment of assistance rendered by subscribers in securing of new orders, a club rate of $1.50 per annum is quoted. This rate applies to new subscriptions in clubs of two or more.

Entered as second-class matter May 26, 1909, at the postoffice at Chicago, Illinois, under act of March 3, 1879.

Group of Members and Guests Attending the Twenty-Eighth Annual Convention of the Association of Superintendents of Railway Telegraph, Boston, June 26.

Telephone Engineer

WITH WHICH IS CONSOLIDATED THE WESTERN TELEPHONE JOURNAL
ESTABLISHED 1902

VOL. VI | CHICAGO, AUGUST, 1911 | NO. 2

HOW MANY TELEPHONE COMPANIES?

THERE is a good deal of misunderstanding about the number of commercial telephone companies in the United States. Statements vary all the way from 5,000 to 25,000 operating systems; and strange to say, both the extreme figures are approximately right.

There are about 25,000 telephone systems operating in this country, including farmer or rural lines. The last official census gave the number as 22,971.

But these farmer or rural lines are not in any sense *companies*. They have neither switchboard nor central office. They are just *lines*—nothing more. And how many of the 22,971 systems do these farmer lines comprise?

Just 17,702.

* * *

The census report gives the total number of stations or telephones as 6,118,578. How many of these belong to the farmers' lines?

Just 565,649.

* * *

Take 17,702 from 22,971 and you have 5,269. That is the number of telephone *companies* operating in the United States at the time of the last census.

The 17,702 farmers' lines have 565,649 instruments—an average of less than *32 instruments apiece*.

The 5,269 operating companies have 5,552,929 instruments—an average of *1,054 instruments apiece*.

77 per cent of the systems have 3½ per cent of the telephones.

23 per cent of the systems have 92 per cent of the telephones.

* * *

The 17,702 farmers' lines have 486,294 miles of wire—an average of less than *28 miles of wire apiece*.

The 5,269 operating companies have 12,513,075 miles of wire—an average of *2,374 miles of wire apiece*.

77 per cent of the systems have 3½ per cent of the wire.

23 per cent of the systems have 96½ per cent of the wire.

* * *

The 17,702 farmers' lines have $1,783,458 annual income—an average of $100 apiece!

The 5,269 operating companies have $184,461,747 annual income—an average of $35,008 apiece!

77 per cent of the systems have *less than one per cent* of the total income of $186,245,205!

23 per cent of the systems have *over 99 per cent* of the total income of $186,245,205!

* * *

All the telephone operating business of this country is, to all intents and purposes, done by the 5,269 companies. The 17,702 farmers' lines are not big enough altogether to be worth considering from a commercial standpoint. Their total purchasing power is practically nil, as compared with the purchasing power of the 5,269 regular companies. So far as the market for telephone equipment goes, there are only about 6,000 possible buyers—allowing for the increase since the last census. Yet the par value of the capital stock and funded debt of these companies amounts to nearly a billion dollars!

In short, the telephone operating business is a concentrated one. Instead of being scattered among 25,000 small units, it is confined to less than 6,000 large, powerful and well managed corporations. *The story we sometimes hear of 20,000 or 25,000 telephone companies is a myth, pure and simple!*

This, then, is an analysis of the field which buys telephone equipment. It will also serve as an analysis of telephone trade paper circulation. The 5,269 operating companies have a total of 15,527 exchanges and 144,169 employees. A trade paper circulating in this field covers the telephone industry absolutely. A trade paper circulating among the 17,702 farmers' line systems, though it goes to every one of them, covers *less than one per cent* of the field, and has practically no value to its advertisers.

AMERICAN SERVICE IN BRITISH EYES.

A DISTANT and impartial observer generally gets a clearer view and a better sense of proportion than does one who is intimately and familiarly associated with the thing observed. We may be sure, therefore, that the report on American telephone systems made to the British Post Office by Messrs. Purves, Martin, Lee and Jones would be very interesting reading to American telephone men. Unfortunately the report is of a confidential nature, and will probably never be published. We have, however, a most interesting record of the observations made by one member of the British exploring party which visited our shores a few months ago. We refer to an article by T. F. Purves in the July number of the *Post Office Electrical Engineers' Journal*.

Mr. Purves is obviously a trained observer. Across the continent of North America he has pursued the even tenor of his way and gathered his own data, without undue dependence upon the carefully prepared statistics of either Bell or independent, manual or automatic. And here and there a thought has occurred to him that some of us, in our haste, may have overlooked.

"I would not give all the credit," he says, "for the wonderful development which has scattered eight millions of telephones up and down the United States to the engineers and commercial managers. The Ameri-

can public has taken to the telephone as a duck takes to water, and its insistent demand has been a continuous spur to those in whose hands the provision of the service has rested. Its progress has been greatly helped by the absence of many of the facilities for cheap and rapid postal and telegraph communication, to which we on this side are so accustomed that we have ceased to notice them. The post is uncertain, and in country districts people have sometimes to travel a long way to post or obtain their letters. It is slow compared with ours, especially for internal city communications. The telegraph has been costly and poorly developed. Even at the present day there is a vast rural community which it does not serve at all."

The remarkable telephonic development of most of our big cities he ascribes largely to the three-dimensional tendencies of those communities. When a man's office is perched, as he says, on the twentieth or thirtieth floor, he wants to do as much business as possible without going outside. And he evidently likes the American skyscraper, too; for he believes London itself would be a much finer place if its streets were twice as wide and its buildings three times as high.

Another point he brings out is the difference between American and English business methods. While the Englishman demands a record of everything, the American makes important contracts and gives large orders by word of mouth—which, of course, directly encourages the free use of the telephones.

His treatment of the Bell-independent division of the field is, on the whole, eminently fair. He gives each approximately half the field, and offsets the Bell advantage in its splendid long distance system with the independent's balance of local sentiment and capital. But he is wrong when he says, "There is, of course, no intercommunication between the rival systems—the Jews have no dealings with the Samaritans—and the quasi-competition plus intercommunication which the British Post Office has for some years been carrying on with the National Telephone Company is beyond their comprehension." The general movement for physical connection is, it is true, rather newer than Mr. Purves' visit; but the practice is old, and many hundreds of small and large independents exchange business with the Bell and have been doing so for years. Moreover, most of these relations are very pleasant and profitable on both sides. The dual service he mentions as still prevailing in many localities is, of course, one of the problems of competitive service; but under the inevitable condition of universal connection this unsatisfactory state will be remedied. It is safe to say that in another five years there will be no such thing in this country as dual service.

The immense number of voluntary and gratuitous services rendered the public by the operating companies of the United States strike Mr. Purves rather forcibly as, indeed, they must anyone who stops to consider them seriously. Take, for example, the number of requests for "the correct time." This item amounts in Chicago alone to 80,000 calls a day—none of them productive of any direct revenue to the telephone company. In addition to this item there are morning calls, sporting news, election returns, etc., which are given the subscriber without cost. Mr. Purves naively remarks that "In these matters there is no scruple about unfair competition with the regular news agencies, such as disturbs the gentle hearts of English telephone authorities."

He pays a remarkable tribute to the American worker in explaining why "the telephone service is distinctly smarter in the large towns of America than it is with us. We have plant and equipment practically identified with that of New York or Chicago, yet the result in speed of service does not seem to be as good. So far as I have had chances of observing in the States, all classes of workers—builders, porters, street excavators, meat packers in Chicago, iron and steel workers in Carnegie's Pittsburg mills, factory hands of all kinds, waiters, clerks, telegraphists, and, I fear I must add, telephone operators—seemed to apply themselves to their business more diligently and whole-heartedly and with more effortless efficiency than we are accustomed to see on this side. Yet in America, telephone operators are much more difficult to get than in this country, and might therefore be expected to adopt more easy-going and independent ways. They have to be attracted to the service by artfully contrived literature showing the supremely fortunate lot of the telephonist, the agreeable society she enjoys, the dining rooms, reading rooms and rest rooms provided for her comfort and delight; all is attractively spread out to view, and only the trifling and apparently irrelevant fact that she is expected to do any work seems to be left unmentioned."

We are accustomed to hear of the more or less dilatory or leisurely methods of the English telephone operator, and usually take it for granted that the long-distance service is of the same nature. But Mr. Purves shows us that this is not entirely true; and indeed, it is just possible that we may have something to learn from the other side in the rather difficult problem of educating the public to the more common use of long distance. See what he says about it:

> The long-distance service in America is often referred to as much more prompt than that given by the British Post Office, but the general statistics of the two services as a whole show that the average delay before a trunk connection can be obtained in England is not very much greater than it is in America. The superiority of the American service is principally in communication between large centers, and in this respect it is indisputable. The explanation is simply that trunk lines between the principal cities are provided in America on a much more lavish scale than has been done in this country. Consequently the American rates are high, as a matter of fact they are two or three times as high as the British Post Office charges for conversations covering the same mileage. This is a very important point which should not be lost sight of when comparing the two systems. The public pays with the usual American readiness, but nevertheless the statistics show that the trunk service is relatively much less used than it is in this country—another very important point in comparisons of public utility. The small man cannot afford the luxury of as much long-distance telephoning as he can here, and the richer users, who can afford it, get the benefit in promptitude of service. In this country, with its lower charges, the trunk lines carry far more traffic, and one has to wait longer for one's turn. It would be a hard matter to get the British public to stand the increase in the trunk charges necessary to pay for the building of the great numbers of additional lines which would be required to bring the service up to the American standard. Each line must bring in an adequate revenue to pay for working and maintaining it if the service is to be conducted on a business footing, and the problem the post office has to face in the speeding up of the trunk service is not at all an easy one. I may say that not only do our trunk lines show a much smaller proportion of idle time than those in America, but the proportion of waste time, that is, time occupied in passing calls and arranging for connections, is also much lower.

The less ample provision of lines in this country has forced the post office to study very keenly how to get the maximum amount of traffic over them in the busy hours of the day, and in this respect we have little to learn from America.

On the point of quality of speech transmission there is not much to choose between the two administrations; if anything, I think, the balance is in our favor. Our lines are, on the average, more carefully constructed. I had many long-distance conversations, and as a rule I found that communication above 400 or 500 miles was not at all easy. There are some specially good lines between important cities, and if one is lucky a very fair talk may be obtained between New York and Chicago—950 miles.

Mr. Purves acknowledges a great interest in the automatic and semi-automatic systems which he saw operating in this country. Of course he heard a great deal for and against them; and he observed that while the Bell companies are not yet converted to the automatic, they have an experimental semi-automatic exchange now in operation in New York, which can readily be adapted to the requirements of full automatic working. As a matter of fact, the British Post Office itself is now installing an experimental automatic system in one of the London offices. An interesting part of Mr. Purves' testimony is that while he confesses a personal preference for manual operation, he and his party took every opportunity to get the attitude of the public, and in the majority of cases found a decided preference for the automatic system in one form or another.

The broad and comprehensive system of rental lines in this country also interested the visitor greatly, since there is no such thing in England. This subject was covered in an editorial last month.

Mr. Purves pays us many compliments and makes no criticisms in his published article. Whether the official and secret report deals as kindly with our peculiarities we can only conjecture. But while we boast of the superiority of our telephone system over any other in the world, let us not forget that the British telephone engineers are highly efficient and capable, and with proper support there is no reason why Great Britain should not reach as great a telephonic development as the United States.

ELECTRIC WAVES GUIDED BY WIRES.

MAJOR GEORGE OWEN SQUIER, with his system of multiplex telephony, has introduced us to a new field of electrical activity. He makes use of frequencies of vibration of a different order from those previously employed in any of the applications of electricity. He has developed into usefulness a portion of the electrical spectrum that was formerly dark to our commercial senses.

There is nothing impractical about the commercial use of electric waves guided by wires in the selection of two or more simultaneous wire currents in the same conductor. The fact that a conductor is used adds practicability to the enterprise, since it conveys in one definite direction a manifestation whose tendency is radiant. The greatest point of practical difficulty undoubtedly lies in the generation of high frequency waves of the order required.

Frequencies of 20,000 to 100,000 cycles per second are hard to obtain in useable form. Those much higher vibrations used in wireless work are readily attained—indeed, they always existed in the discharge of the Leyden jar or other condenser. The lower frequencies of the regular telephone circuit are, of course, those of sound and the ordinary aural phenomena. But the frequencies of the wire-guided wave are apparently entirely artificial. They require a specially designed generator for their production.

The generator used in Major Squier's experiments is entirely practical as a laboratory instrument. As a commercial apparatus, however, it will doubtless have to be modified. Its mechanical features are so exceptional that it is doubtful if any considerable number like it could be produced on order and guaranteed to operate free from trouble. Here are some of its peculiarities:

Its armature rotates at a speed of 20,000 revolutions per minute. The diameter of the rotor being twelve inches, the peripheral speed attained is 1,047 feet per second, or 700 miles per hour. As Major Squier says, at this speed it would roll from the United States to Europe in four hours, or from New York to Chicago in about an hour and a quarter. The centrifugal force at its periphery is 68,000 times the weight of the metal there. The extraordinary care required in the selection of material and construction of such an apparatus may be imagined.

Yet even at this rate of rotation it is necessary for the rotor to have 300 slots in its periphery to make the required number of current reversals per second. The slots are spaced ⅛ of an inch between centers. It is necessary to pump a continuous stream of oil through the bearings to allow continuous running without heating, and a third bearing is required on the machine to guard against excessive vibration of the shaft at two critical periods, one of which occurs at about 1,700 and the other at about 9,000 revolutions per minute.

The generator is a mechanical marvel—almost a freak. For that reason some other means must be devised for developing electric current at frequencies of 20,000 to 100,000. But it is a mistake to anticipate any extraordinary difficulty in the way of such development. The requirement is very young—indeed, the machines of this nature which have been built so far could probably be counted on the fingers. Last March we received an interesting communication on this subject from A. Stein, Jr., Pittsburg, which we quote again:

In Professor Fleming's "Principles of Electric Wave Telegraphy," dated 1906, Professor Fleming, after giving a list of the high-frequency generators which had been built up to that time, this list varying from a 10,000 cycle alternator, output 1,000 w., to a 120,000 cycle alternator, output 0.2 w., says:

"The great defects of all high-frequency generators so far made are their small output and the extremely high speeds at which they have to run. High speeds may be practicable with very small generators, but would be dangerous if the revolving parts were at all heavy. On the whole, the prospect of being able to generate by purely mechanical means high-frequency currents of frequency 100,000 and upwards with large power output is not very great."

In his book published in 1908 on the same subject, he shows several machines, one of them designed by C. G. Brown, with a maximum of 30,000 cycles per second, and still expresses a doubt as to the practicability of making high-frequency generators of large output.

During this period of wireless development work, Mr. Fleming was not alone in his opinion as to the practicability of generation of high-frequency currents by mechanical means, and very few investigators along this line of endeavor considered it worth their while to devote much time to it.

Some time previous to 1903, Professor Reginald A. Fessenden of the National Electric Signaling Company had made a high-frequency generator delivering 10,000 cycles per second, and at that time and since then he has experimented with and

developed high-frequency generators, until at the present time, he has made such alternators up to 100,000 cycles and two or three k. w. output. He is having built at the present time, alternators of larger output, and it seems very likely that he will be as successful in this as he has been in smaller sizes up to two and three k. w.

In 1909 the National Electric Signaling Company sold to the Signal Corps of the U. S. A. a direct-connected high-frequency alternator of the exact type shown in Mr. Larson's article.

Mr. Fessenden has patents pending covering the work he has done on high-frequency generators, and he has described them in many of the technical journals and in his paper before the American Institute of Electrical Engineers at Atlantic City.

Which goes to show that while the generator may not be entirely new, the demand for it is.

It is safe to say that the problem will not be solved ultimately in this way. Some method may develop for stepping up a lower frequency through a series of rotary devices operated at reasonable speeds; or some type of vibratory apparatus may be designed to accomplish the same end. At any rate, it is a task for the inventors—and necessity never has to wait very long on invention in this country.

The generator is the key to the practicability of the whole Squier system. Everything else in his circuit is surprisingly simple and well-known—quite commonplace, in fact. Given a practical source of high-frequency waves and multiplex telephony will become as common as the phantom circuit is now.

THE TELEPHONE REPORT MANIA.

TO get a report is one thing, to be satisfied with it is another. The obvious thing for a municipality to do, if it is not pleased with the report it has hired experts to make on its utilities, is to hire more experts and get more reports. If the supply of experts holds out, and there is enough money in the appropriation to pay them, it is only a question of time when one will be found who can give the kind of report wanted.

Chicago is now preparing for the third successive report upon its telephone system. The first was made jointly by Arthur Young & Company and D. C. & W. B. Jackson, and was completed May 9, 1910. As it showed that the Chicago Telephone Company was losing money, it was not exactly what the city wanted. So when it was found that Messrs. Young & Company had done work previously for the telephone company, the whole report was thrown in the waste basket.

The city then engaged W. J. Hagenah, an expert connected with the Wisconsin Railroad Commission. The comprehensive telephone report which he and his assistants prepared cost Chicago about $6,000, and was regarded as very satisfactory because it reversed the previous report and found that the telephone company was making too much money and should have it rates reduced. Mr. Hagenah also investigated the city's gas utility, and with a similar result.

So far as the city was concerned, the matter might have rested there, although court action on the part of the utilities affected was looked for. But it happened that just about this time the politics of the council committee changed. Mr. Hagenah unwittingly became involved in the subsequent revolution, and almost before he knew it he had resigned his expertship.

July 17 the committee instructed Edward W. Bemis to prepare a third report on the Chicago Telephone Company. This he will at once proceed to do at an estimated cost of $4,000. Part of his work, of course, will consist in checking up the Hagenah report on such items as present value, depreciation, etc.; though it will not be surprising if he decides it is necessary to make a new investigation throughout, as Hagenah did when he had the Jackson report.

How many times a public utility can reasonably be expected to lend its aid and co-operation to these investigations does not appear. The word reasonably is used advisedly, since the ordinance merely states that the company's affairs shall be open to authorized inspection at any reasonable time. It is interesting to observe here that when Mr. Hagenah completed his gas report he left his data and figures with the gas company, and when Mr. Bemis appeared on the scene, that corporation promptly and emphatically declined to continue to open its books and heart to a succession of investigators *ad infinitum*. In the words of Montague Glass, enough is plenty.

SOUTH AFRICAN TELEPHONES.

Consul General Richard Guenther, Cape Town, South Africa, says:

According to the *Cape Times* of February 7, 1911, the government has decided that the message rate shall be introduced as soon as the necessary changes in the telephone system can be brought about.

There is now under construction a new switchboard of the pattern known as the central battery, which means no ringing on the part of a subscriber and no battery at his end. Payment will be made on the basis of the number of calls, all calls being registered by meters.

The introduction of the system into the Cape means the installation of an entirely new switch room equipment, and a different class of telephone in every subscriber's office. This is a work of considerable magnitude, which will take many months to complete, and will also cost a large sum of money. The conversion of the system, even in Johannesburg, is not absolutely complete, although the work has been in progress for two or three years, and in Cape Town the change will also take place gradually.

At first glance it does not seem that the business man who makes considerable use of the telephone will benefit much by an installation charge of £10 ($48.66) with 900 free calls, three a day, as against the present tariff of the same rate for an unlimited service. On the other hand, the small charge in the Transvaal for private residences, about $24, with 600 calls a year, or two a day, if applied in the Cape Peninsula, would mean considerable advantage to the small user of the telephone. It is therefore confidently anticipated that the number of subscribers will be increased.

In the Rand the area is divided into circles, and the charges are as follows, according to the *Times:*

Within a 5-mile circle, two cents a call; between 5 and 10 miles, four cents; over 10 and under 25 miles, six cents.

In Cape Town in all probability a similar system will be adopted and a radius will be made embracing the suburbs and practically all the outlying places of any importance. The change, however, will not take place until the central exchange equipment is in position. At the same time all expedition is being used, with a view to as early a change as possible.

Why Subscribers Lose Calls

By J. W. Hepner

A THING calculated to create doubt in a friend's veracity is to have made an appointment to receive a telephone call, then to sit around all evening, and hear nothing that sounds like a ring. And the next morning to be met with the salutation, "Where were you last evening? I tried several times to get you, but was always told that you did not answer," is to have the suspicion confirmed.

When you study over it, and think of the frailty of human nature, do people really call every time that they say they do? Undoubtedly some calls that people believe are lost, never get started. As one thinks of the few ways calls may be lost, it seems strange that so many never reach their destination.

There are people who like to throw the blame of their shortcomings on some one else. Truth is secondary to convenience. Some who often have an engagement that they do not wish to keep, use the telephone as a tool to get them out of their troubles. They have a smooth way of saying that the operator told them there was no response to their calls. With its many calls daily, the company is not in a position to refute the charge. Yet the lost-call complaints are a good barometer of service in the exchange; for those due to apparatus and subscribers always remain about the same. As the service grows poorer, the inaccuracy and carelessness of operators, which lead to complaints, increases. It is not right to charge an incoming complaint against the exchange of the complaining subscriber. The chief operator of that exchange is almost powerless to remedy the evil. She must trust that the service in the exchange where the calls originate will improve.

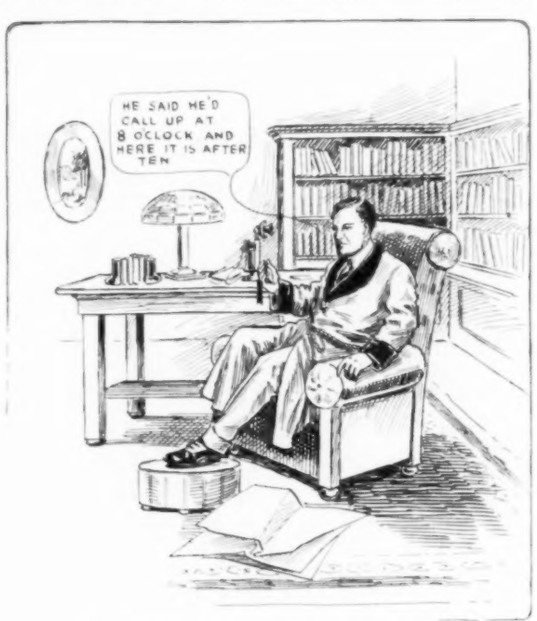
"Why, the Bell Never Rang!"

The reasons for lost calls may be classified under three headings:

1. Those due to the subscribers.
2. Those due to the apparatus.
3. Those due to the operators.

The most prominent of the subscribers' faults, especially in the resident districts, is that they forget that they leave the house for a few minutes to gossip over the back fence, to run across the street to the grocery, or to work in the back yard, attic or basement: any of which might take only a few minutes—but in the meantime the operator rang the bell repeatedly, and gave out the reply, "don't answer." And the next day—"Where were you yesterday?" "I was at home all day." "The girl said that you would not answer." "Why, the bell never rang! My friends tell me often that they are unable to get me. I will not stand such service any longer. I will report that to the manager."

Or it may be some store or business place where there is, or should be, some one always present to answer the telephone. Perhaps there is, but he may be busy or out of hearing. Some time ago I was waiting at an interurban station, when by the continuous ringing of a telephone bell, my attention was attracted to a conversation over the other telephone. This ringing at first did not seem to disturb the office boy, but finally he said, "Wait a minute until I stop this noise." Business firms through such neglect and inattention lose many calls, which reflects upon the service; and the company is powerless to satisfy the subscriber, as he knows there is or should have been some one there.



"To Sit Around All Evening, and Not a Ring."

A good way to cure some of those who are so sure they are losing important calls, is to keep ringing their bell every five or ten minutes until you get a response. We had a subscriber who complained that she could not raise her house. She said other people told her that they had had the same trouble. She knew that some one should answer, as her husband and children were there. We kept on ringing her number until finally a man answered. In reply to "Have you been there close to your telephone"? he said "Yes." That made

us think there was trouble; but as he continued "I was up-stairs asleep," our doubts vanished, likewise the complaint. Party line subscribers, through ignorance of conditions, imagine that many calls are lost due to their line being reported "busy," when it is not so to them. They do not know or stop to think that when any party on the line is busy the whole line is busy.

Business men almost every day lose calls which mean business, because their lines are reported "busy." People have business which must be transacted at once. Not knowing any particular firms, they look in the directory and take the nearest one. Should this be busy, they do not wait for the connection to be taken down, but look up another number. Such lost calls are beyond the help of the operating department, but may be of valuable assistance to an enterprising and energetic contract department.

Business men as a rule will appreciate it if the company will show them that they do not have sufficient lines, or if the free use of the telephone by clerks is a detriment to business.

Lack of foresight or money by the engineering department is a source of trouble daily. Cables large enough to give sufficient trunking capacity to take care of the future growth could not be, or at least were not, installed. The oftener the "B" operator reports "overflow," the oftener the subscriber has a just complaint for losing calls.

Many subscribers have the idea that they can always remember numbers without referring to their directory, which results in their calling wrong or dead numbers, not only making themselves angry, but condemning the operator for giving them the wrong number, besides being an annoyance to the called subscriber. After one or two ineffectual attempts they tell their friends they were unable to get them. Naturally the company hears of it.

Where there are two systems of competing exchanges, some subscribers have both telephones. Sometimes through poor foresight of the officials, there is an exchange on each system of the same name. Thinking they know the number and exchange, subscribers will call the Bell number on the independent telephone, or vice versa.

With many people, figures have a habit of getting reversed or transposed. To such a person a number of three figures has five out of six chances of being wrong. The probabilities are that one or more of these numbers are dead or main line with a selective first party bell. The operator in a large exchange having no way of knowing that the transposed number is dead, rings as she should, and reports "Don't answer." This fault of transposing numbers occurs daily in the operating department. The number will be repeated correctly to the subscriber, but plugged in the multiple or given over the order circuit transposed. In small exchanges, the operators soon learn which lines are not in use, and are able to correct such mistakes. As the size of the exchange increases, the operator's familiarity with the lines decreases. In the large exchanges she has to depend entirely upon the markings. Errors in markings will creep in to the detriment of the called subscriber, for his telephone was reported "taken out." We have one advantage over the operators that is not possessed over the subscribers: We can educate them to use the branch exchange prefix.

In the large cities, where there is a system of branch exchanges, poor articulation on the part of operator and subscriber, or the operator not pressing the right exchange order wire button, sends the call to a wrong exchange. Often the operator, after pressing the wrong button, does not realize that the trunk assigned does not belong to the exchange called for; the subscriber in the meantime waits on the trunk until he is told that his party "don't answer."

In tracing out a subscriber's complaint, we found that he was calling for Dorr 126. The operator, mistaking the prefix and in violation of her rule against giving a number without the prefix, took a busy test on 4126. She got the out-of-order test, and so reported to the subscriber. He, not being satisfied, called the trouble clerk, and received the same report. Going to Dorr 126, he found the line working all right. The Dorr exchange told him that the line had never been reported out of order. Result: one lost call and two dissatisfied subscribers.

The inanimate servant of the traffic department, the apparatus, has to take a great deal of blame where it is not guilty, although if not watched it can cause a lot of trouble, especially in this day of improved apparatus, since steel cords and harmonic ringing machines have made their presence known.

Steel cords will not stand the abuse that tinsels would. A tinsel cord as it grows bad gets noisy. The worse it is, the noisier it gets. It tells you it needs attention. But the steel cord gives up all at once. Sometimes it kicks a little making a cut out. When the trouble is in the tip strand of the calling cord, it will not be noticed at once, as the operator thinks she is ringing, but the subscriber does not answer.

Back of the cord is the ringing key, which is a prolific source of trouble. In some of the modern ringing keys there are as high as eight make-and-break contacts. Each contact is a possible chance for a series of lost calls. These contacts get dirty or out of adjustment; at times they will not ring, and again after ringing the key will not close the circuit. The operator will test for ringing, and think her cord all right, yet one side of the cord may remain open. Should this be on the tip of the calling cord it will not be noticed, even if the subscriber answers, for the supervisory lamp will remain burning. The called subscriber may faintly hear his caller being told that he does not answer. When such a condition exists on a trunk, there is not the chance to detect it as soon as on a local cord. On a local cord, the subscriber and operator are in a closer relation than the subscriber and the "B" operator and poor contacts anywhere mean lost calls.

In the early days of telephony, stick ringers provided a much abused excuse for managers and trouble men when they could find no other trouble. But today in systems which use convertors this old friend cannot be called into service. That does not mean that the subscriber's bell rings whenever the proper button is pressed. A rise or fall in the voltage of the storage batteries, dirty contacts, too close adjustment of the contacts of the machine, weight of armature and stiffness of bell springs all tend to affect the bells. Often a bell will ring nicely when it is installed, but let the voltage or adjustment of the springs vary, and it will not ring, often depending upon how the operator presses her key. Calls lost through these conditions are difficult troubles to handle.

Magneto systems have one trouble from which common battery systems are free. Subscribers who have desk sets frequently set the pedestal upon the bell box, in this way short circuiting the line. When

they go to use the telephone they pick up the pedestal and ring central all right; but in the meantime others have had calls which they did not get.

In exchanges with large multiple boards, a peculiar complaint comes that some one subscriber cannot get calls from a certain other subscriber. If the latter goes to the next door neighbor, she always receives the call. The line will test all right through the multiple, but on examination of the multiple jack nearest the answering jack of that particular line, it will be found that the wires are broken off the spring of the jack, yet are soldered together, thereby giving continuity through the board.

Subscribers lines often get into trouble from opens, grounds or shorts that they know nothing of, until some friend reports an unsuccessful attempt to reach them. The hook switch breeds many complaints from subscribers. When poor material is used in the construction of the springs and contacts, they are continually out of adjustment or have dirty contacts. Either cause will leave the line open when the receiver is on the hook, but the subscriber is able to get the exchange without trouble.

There is one cause for subscribers losing calls which can hardly be classed in any one of the divisions mentioned—that is, failure of the management to provide efficient or sufficient help on the other circuits. When the "B" operator is inefficient or overloaded, all the faults of transposing, plugging wrong multiple, taking wrong busy tests, will be increased by getting the "A" operator, as well as herself, confused into taking wrong assignments. There is no cause which will produce such wide-spread dissatisfaction among subscribers so quickly as poor service on the trunking position. The complaints arising from this cause are the hardest to handle.

Multiplex Telephony and Telegraphy*

By Major George O. Squier

I. INTRODUCTION.

ELECTRICAL transmission of intelligence, so vital to the progress of civilization, has taken a development at present into telephony and telegraphy over metallic wires; and telegraphy, and, to a limited extent, telephony, through the medium of the ether by means of electric waves.

The limits of audibility, being a physiological function, are well known to vary considerably, but they may be taken to be in the neighborhood of 16 complete cycles per second as the lower limit and 15,000 to 20,000 cycles per second as the upper limit. If, therefore, there is impressed upon a wire circuit for transmitting intelligence harmonic electromotive forces of frequencies between 0 and 16 cycles per second, or, again, above 15,000 to 20,000 cycles per second it would seem certain that whatever effects such electric wave frequencies produced upon metallic lines, the present apparatus employed in operating them could not translate this effect into audible signals.

There are, therefore, two possible solutions to the problem of multiplex telephony and telegraphy upon this

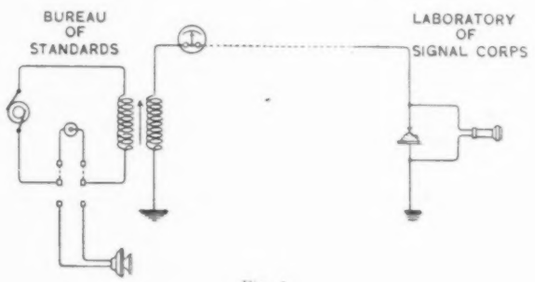


Fig. 1.

principle by electric waves, based upon the unalterable characteristic of the human ear, *viz.*, by employing (1), electric waves of infra-sound frequencies, and (2) those of ultra-sound frequencies. One great difficulty in designing generators of infra-sound frequencies is in securing a pure sine wave, as otherwise any harmonic of the fundamental would appear within the range of audition. Furthermore, the range of frequencies is restricted, and the physical dimensions of the tuning elements for such

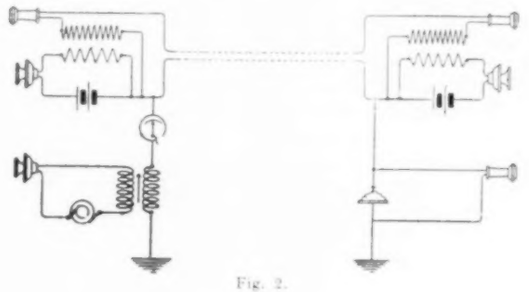


Fig. 2.

low frequencies would have a tendency to become unwieldy.

The electromagnetic spectrum at present extends from about four to eight periods per second, such as are employed upon ocean cables, to the shortest waves of ultra-violet light. In this whole range of frequencies there are two distinct intervals which have not as yet been used, *viz.*, frequencies from about 3×10^{12} of the extreme infra-red to 5×10^{10}, which are the shortest electric waves yet produced by electrical apparatus, and from about 80,000 to 100,000 cycles per second to about 15,000 to 20,000 cycles per second. The upper limit of this latter interval represents about the lowest frequencies yet employed for long distance wireless telegraphy.

The necessary condition for telephony by electric waves guided by wires is an uninterrupted source of sustained oscillations, and some form of receiving device which is quantitative in its action. In the experiments described in multiplex telephony and telegraphy it has been necessary and sufficient to combine the present engineering practice of wire telephony and telegraphy with the engineering practice of wireless telephony and telegraphy.

*Paper presented at the 28th annual convention of the American Institute of Electrical Engineers, Chicago, Ill., June 26-30, 1911.

The frequencies involved in telephony over wires do not exceed 1,800 to 2,000, and for such frequencies the telephonic currents are fairly well distributed throughout the cross section of the conductor. As the frequency is increased the so-called "skin effect" becomes noticeable, and the energy is more and more transmitted in the ether surrounding the conductor.

It has been found possible to superimpose, upon the ordinary telephonic wire circuits now commercially used, electric waves of ultra-sound frequencies without producing any harmful effects upon the operation of the existing telephonic service. Fortunately, therefore, the experiments described below are constructive and additive, rather than destructive and supplantive.

Electric waves of ultra-sound frequencies are guided by means of wires of an existing commercial installation and are made the vehicle for the transmission of additional telephonic and telegraphic messages.

APPARATUS AND EQUIPMENT.

Under a special appropriation granted to the Signal Corps by Congress in the Army Appropriation Act of 1909, a small research laboratory has been established at the Bureau of Standards, in the suburbs of the city of Washington. This laboratory is equipped with the latest forms of apparatus now employed in the wireless telephone and telegraph art, and also with the standard types of telephone and telegraph apparatus now used upon wire circuits. The small construction laboratory of the U. S. Signal Corps is located at 1710 Pennsylvania avenue and is also equipped with the usual types and forms of apparatus used in transmitting intelligence by electrical means. Each of these laboratories is supplied with a wireless telephone and telegraph installation with suitable antennæ. In addition, these two laboratories are connected by a standard telephone cable line about seven miles in length, which was employed in the experiments described below.

The high-frequency alternator is a special form of the inductor type designed for a frequency of 100,000 cycles with an output of two kw., making it adapted for use in wireless telephony or telegraphy.

The motor is a shunt-wound 10-h.p. machine with a normal speed of 1,250 rev. per min. It is connected by a chain drive in an intermediate shaft which runs at a speed of 2,000 rev. per min. The intermediate shaft drives the flexible shaft of the alternator through a De Laval turbine gearing, having a ratio of ten to one. The flexible shaft and inductor thus revolve at a speed of 20,000 rev. per min.

The inductor or rotor has 300 teeth on each side of its periphery, spaced 0.125 in. (0.491 mm.) between centers. The spaces between the teeth are filled with U-shaped phosphor bronze wires, securely anchored, so as to withstand the centrifugal force of 80 lb. (36.2 kg.) exerted by each. Since each tooth of the inductor gives a complete cycle, 100,000 cycles per second are developed at 20,000 revolutions per minute. The diameter of the disk being one foot (0.3 m.), the peripheral speed is 1,047 ft. (219 m.) per sec., or 700 miles per hour, at which rate it would roll from the United States to Europe in four hours. By careful design and selection of material, a factor of safety of 6.7 is obtained in the disk, although the centrifugal force at its periphery is 68,000 times the weight of the metal there.

With the normal air-gap between the armatures and revolving disk of 0.015 in. (0.059 mm.), the potential developed is 150 volts with the armature connected in series. It is possible, however, to decrease the air gap to 0.004 in. (0.015 mm.) for short runs, which gives a corresponding increase in voltage up to nearly 300 volts. It is considered inadvisable, however, to run with this small air gap for any considerable length of time.

The machine is intended to be used with a condenser, the capacity reactance of which balances the armature inductance reactance which is 5.4 ohms at 100,000 cycles. This would require a capacity of about 0.3 microfarad for resonance at this frequency, but in the experiments conducted at 100,000 cycles it was found necessary to decrease this amount on account of the fixed auxiliary inductance of the leads.

CONSTANTS OF THE TELEPHONE LINE.

The telephone line used in these experiments extends from the Signal Corps laboratory at 1710 Pennsylvania avenue to the Signal Corps research laboratory at the Bureau of Standards.

This line is made up of the regular standard commercial equipment and consists of paper-insulated, twisted pairs in lead covered cable, placed in conduit in the usual manner employed for city installation. For the sake of convenience one of the pair is designated as No. 1 wire and the other as No. 2 wire.

The air-line distance between the two laboratories is a little over three miles (4.8 km.), but the telephone line, by passing through three exchanges, covers about seven miles (11.26 km.). The course of the line, with the size and type of conductor, is as follows:

Laboratory to Main Exchange, underground cable, No. 22 B. & S.

Main Exchange to West Exchange, underground cable, No. 19 B. & S.

West Exchange to Cleveland Exchange, underground cable, No. 19 B. & S.

Cleveland Exchange to Bureau of Standards, underground cable, No. 19 B. & S.

Underground cable except from Bureau of Standards to Wisconsin Avenue and Pierce Mill Road, about 3,400 feet, which is aerial cable.

This line is equipped with protective heat coils of a standard type, one in each wire of the metallic circuit, at the Cleveland Exchange and the Main Exchange, but none at the West Exchange. The constants of each of these coils are as follows:

Direct current resistance of 65 deg. fahr	3.8 ohms
Size of wire	No. 30 B. & S.
Length of wire	40 cm.
Number of turns in each coil, about	38
Measured inductance at 70,000 cycles	4,400 cm. or 4.4×10^{-6} henry

The above constants were measured from a sample of one of these coils selected at random.

Resistance of metallic circuit	= 776 ohms
Capacity measured (one minute electrification) between No. 1 and No. 2 wires	= 0.69 microfarad
Insulation resistance—	
Between No. 1 wire and earth	= 0.9 megohms
Between No. 2 wire and earth	= 1.3 megohms
Between No. 1 and No. 2 wires in parallel and earth	= 0.8 megohms
Between No. 1 and No. 2 wires	= 2.1 megohms

The line included the usual house-wiring at each station, which was undisturbed in taking the measurements.

II. DUPLEX-DIPLEX TELEPHONY OVER WIRE CIRCUITS.

Such has been the development of telephone engineering that at present any proposal which requires for its success the supplanting of the present low frequency battery system would be most radical. It would surely

be admitted that any plan which permits the present engineering telephone system to remain intact and superimpose thereon additional telephone circuits would possess cardinal advantages. Accordingly, the first preliminary experiments were directed to the inquiry as to whether or not it is possible to superimpose upon the minute telephonic currents now employed in telephony over wires, electric waves of ultra-sound frequencies without causing prohibitive interference with the battery telephone currents. Manifestly, this fundamental point can best be determined by experiments, at the generator itself, with the most sensitive part of the telephone equipment, *viz.*, the telephone receiver.

With a collction of telephone receivers ranging from about 50 to over 8,000 ohms and of a variety of design, a series of tests was made under severe conditions to determine the above point. It was found, in general, that alternating currents of frequencies ranging from 30,000 to 100,000 complete cycles per second, when coupled directly, inductively, or electrostatically to local circuits from the generator produced no perceptible physiological effects in the receivers.

The next fundamental point to determine was whether or not at these frequencies a telephone can receive enough energy to make it operative for producing sound waves in air.

Since the self-induction of a standard telephone receiver is high, energy at these frequencies is effectively barred from it. In the wireless telegraph art, where the frequencies involved are from one hundred thousand to several million per second, this problem has been uniformly solved by the introduction of some form of detector of electromagnetic waves, whose function is to transform

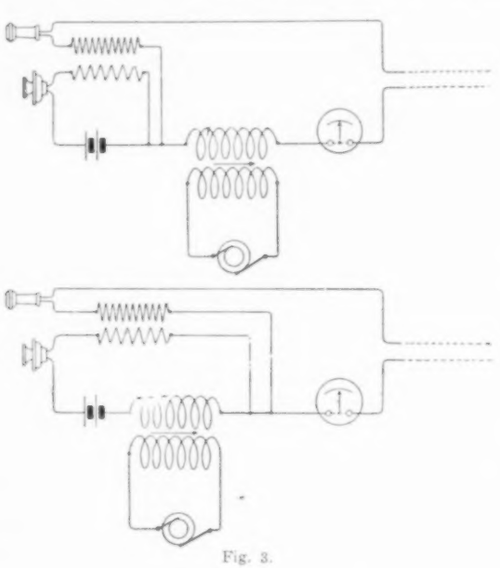


Fig. 3.

the energy of the high-frequency oscillations into other forms suitable to a type of instrument such as a telephone receiver.

The next step, therefore, consisted in introducing various forms of detectors, such as are now used in wireless telegraphy, between the telephone receiver itself and the energizing circuit. Since the frequencies being here considered are entirely above audition it was necessary, in order to produce a physiological effect, to introduce another element in this transformation, *viz.*, some method of modifying the continuous train of sustained oscillations from the generator into groups or trains, the period of which falls within the limits of audition. This was accomplished by employing the regular forms of automatic interrupters, such as are now used in wireless telegraphy, with the expected result that with these two additional and essential pieces of apparatus operatively connected between the telephone receiver and the generator, the energy of the generator was delivered to

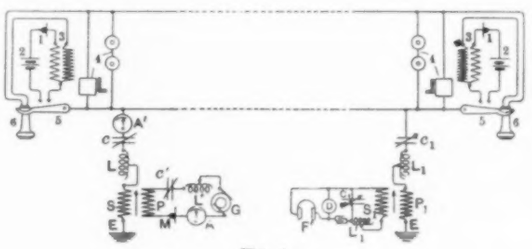


Fig. 4.

the ear in a form well suited for physiological effects. Since it is well known that the human ear is most sensitive at a period of about 500 cycles per second, or 1,000 alternations, interrupters giving this frequency were employed.

The elements of the apparatus thus far include a generator of standard high-frequency oscillations, an interrupter to modify the amplitude of these oscillations into groups of a period within the range of audition, some form of detector to rectify these oscillations, and a telephone receiver. Manifestly here are all of the elements that are necessary for telegraphy, using the telephone receiver to interpret the signals.

If in the above mentioned chain of apparatus the interrupter is replaced by some form of telephone transmitter, such as the microphone, this is all that is necessary for the transmission of speech.

Having determined the necessary and sufficient conditions for the accomplishment of telegraphy and telephony by means of electric waves guided by wires upon local circuits, the next step was to apply these means and conditions to an actual commercial telephone cable line, the constants of which have been given above.

The machine was run at a frequency of 100,000 cycles per second with the circuit arrangement as shown in Fig. 1, where one wire of the telephone cable was connected to one terminal of the secondary of an air-core transformer, the other terminal being connected to earth.

At the receiving end of the line, which was the Signal Corps construction laboratory, at 1710 Pennsylvania avenue, Washington, D. C., this wire was connected directly to earth through a "perikon" crystal detector, such as is well known in wireless telegraphy, and a high resistance telephone receiver of about 8,000 ohms was shunted around the crystal. In this preliminary experiment no attempt was made at tuning, either at the transmitting end or at the receiving end of the line.

In the primary circuit of the generator, arrangements were made by which either an interrupter and telegraph key or a telephone transmitter could be inserted by throwing a switch.

In the line circuit a hot wire milliammeter was inserted in a convenient position so that the effect of the operation of either the telegraph key or of the human voice upon the transmitter could be observed by watching the fluctuations of the needle of the milliammeter.

A loose coupling was employed between the two circuits at the transmitting end, and the line circuit adjusted by varying the coupling until the current in the line was twenty to thirty millamperes. With this arrangement (1) telegraphic signals were sent and easily received, and (2) speech was transmitted and received successfully over this single wire with ground return.

The ammeter showed marked fluctuations from the human voice and enabled the operator at the transmitting station to be certain that modified electric waves were being transmitted over the line.

The actual ohmic resistance of the line apparently played an unimportant part of telegraphy at 100,000 cycles, since with one of the wires of the pair and a ground return, the effect of doubling the conductivity of the wire by joining both wires in parallel although this arrangement increased the capacity of the wires, could not be detected with certainty by an operator listening to the signals and unaware of which arrangement was being used.

Inserting in the line wire a non-inductive carbon rod resistance of 750 ohms, which is practically the resistance of the line itself, could not be detected by any change in the intensity of the received signals.

The next experiment was to determine what effect, if any, such sustained electrical oscillations would have upon the minute telephonic currents employed in battery telephony.

DUPLEX TELEPHONY, USING ONE GROUNDED CIRCUIT.

To determine the fact that electric waves of ultrasound frequency produce no perceptible effect when superimposed on the same circuit over which telephonic conversation is being transmitted, the next step was to use such a train of sustained oscillations as the vehicle for transmitting additional speech over the same circuit. For this purpose the twisted-pair telephone line was equipped with a complete standard local battery telephone set, as installed for commercial practice, and in addition one of the wires of the pair was equipped as in Fig. 1, the circuit being shown diagrammatically in Fig. 2. This particular arrangement was employed in this experiment for the reason that it was desired to have the battery telephone operate on its usual circuit with the introduction of ground connections at the ends of the line for the super-position of the high-frequency circuit. When such ground connections were introduced directly without tuning elements therein the metallic circuit experienced the usual disturbances found under city conditions, but the metallic circuit could be reduced to silence again by introducing in the ground connections the necessary tuning elements of magnitudes suited to wireless telegraphy.

Next, the local battery circuit of the transmitter telephone set was opened and a few turns of coarse wire inserted in series with the two dry cells which are normally used, as shown in Fig 3. Inductively connected with this coil was the armature circuit of the generator. The direct current voltage and the alternating current voltage in series with it in the primary circuit of the transmitter were varied individually and relatively in a variety of ways, with the striking result that just at the point where the direct current voltage was decreased, so that no sounds were received, the line became absolutely silent, although the alternating voltage in the circuit was at its largest value, or, again, speech would reappear at the receiving station at the moment when sufficient direct current voltage was introduced to produce it, and the simultaneous presence of both the maximum direct voltage and the maximum high-frequency voltage in a circuit produced exactly the same result as the maximum direct current voltage did alone. When, however, the high-frequency current in the local circuit was forced to a point which caused "burning" in the transmitter itself, then only did the high-frequency current in any way interfere with the transmission.

By transferring this coil from the local circuit of the telephone set directly into the line itself, so that the higher frequency oscillations would be superimposed upon the line beyond the iron cord induction coil of the telephone transmitter, it was not possible to detect the presence or absence of high-frequency currents.

As a test under severest conditions the effect was noted upon speech received at the same station at which the high frequency current is being impressed, for here are the attenuated telephonic currents at the receiving end of the telephone line, on which is superimposed a high-frequency current of vastly greater magnitude at the same point. No effects of any kind could be detected under these conditions.

SILENT EARTH CIRCUITS.

The electromagnetic constants of the apparatus employed in telegraphy and telephony over wire circuits are of the order of magnitude of microfarads and henrys, and since no attempt is made at tuning, these are constructed at present with no provision for continuously varying the units.

In the operation of providing tuning elements for earth connections there is at the same time afforded a certain means of eliminating any harmful disturbances from the earth, for the condensers employed for tuning to frequencies above audition possess an impedance to the frequencies involved in speech and also any other disturbances from the earth, which effectively prevents the passage of any disturbance of audible frequency. These condensers offer a comparatively free passage to the electrical oscillations of the frequencies here being considered. Simple experiments proved the efficiency of this arrangement, and when the metallic telephone circuit, equipped with a standard local battery set, was connected to earth in the manner described, the operation of the battery set was perfectly quiet and equally good with and without such earth connections.

The point was now reached where the road was clear for duplex telephony, and for this purpose the apparatus and methods employed in wireless telephony were applied to one of the wires of the metallic circuit as though it were an antenna. The actual arrangement of this circuit is shown in Fig. 4, in which G is the source of sustained high frequency oscillations; C' is the tuning condenser of the oscillatory circuit; L' is the tuning inductance of the oscillatory circuit; P is the primary of the oscillation transformer; A is the ammeter; M is the transmitter microphone; S is the secondary of the oscillation transformer in the line circuit; C is the tuning condenser in the line circuit; L is the tuning inductance in the line circuit; A' is the ammeter in the line. At the receiving end of the line C_1 is the line tuning condenser; L_1 is the line tuning inductance; P_1 is the primary of the oscillation transformer; S_1 is the secondary of the oscillation transformer; L_1' is the tuning inductance in the oscillatory circuit; e_1' is the tuning condenser in the oscillatory circuit, between which and the telephone F' the detector D is operatively connected; E is the earth connection.

The local battery telephone sets are connected across the two line wires in the usual manner. In both sets I is

the microphone transmitter; 2 is the local battery; 3 is the induction coil; 4 is the ringing system, including the bell and hand generator; 5 is the switch hook; 6 is the telephone receiver.

It was found that cross-talk was heard in the audion circuit from the battery transmitter at the transmitting end when the audion circuit alone was connected directly to earth from the line without any tuning coil or condenser. If, however, the tuning condenser was inserted, this cross-talk entirely disappeared, even though the tuning coil was not inserted. This is because the impedance of the small tuning condenser is large for telephone frequencies, while the tuning coil impedance admits these telephonic frequencies. Both elements of tuning are required for selective absorption of energy, so that the high-frequency circuit is available as an additional telephonic circuit. With this arrangement talking in the transmitter of the high frequency side of the system was heard only in the audion and there was no cross-talk from the ordinary local battery circuit. Similarly, there was no effect of the high-frequency transmission on the local battery transmission, and the two telephonic messages were completely separated. Both circuits were entirely free from earth disturbances.

The volume of speech is greatly increased at the receiving end of the cable by the simple device of inserting the transmitter in the dynamo circuit and operating this circuit at or near resonance. In addition, the coupling at both transmitting and receiving stations should be so designed as to permit adjustment for optimum.

There was no high-frequency dynamo available at the laboratory. There is, however, available at this laboratory one of the latest forms of the high-frequency arc, and accordingly this was arranged with suitable electromagnetic constants to give a period of about 71,000 cycles per second. This source of high-frequency electromotive force was induced upon the high-frequency line wire in a similar manner to that described in the station at the Bureau of Standards, with the result that one of the wires of the twisted-pair was made to carry simultaneously the battery telephonic currents from the two transmitters, the high frequency oscillations of about 100,000 cycles per second, applied at the Bureau of Standards, and the high-frequency oscillations of about 71,000 cycles per second, applied at the laboratory. No influence from these conditions was perceptible upon the excellence of the battery transmission and reception of speech either way. *(To be continued.)*

Exclusive Contracts Upheld in Missouri

The Missouri Supreme Court by unanimous decision Monday, July 3, decided that the exclusive physical connection contracts between the independent telephone companies of Missouri are valid and enforcible.

This decision in effect binds together all the independent companies of the state into a continuous system for long-distance purposes in competition with the Bell company and at the same time continues the local ownership of the various companies. Under this decision the Bell company must withdraw all its lines from the switchboards of local companies who had signed these contracts and were a part of the association of independent companies.

The case in question was by the Home Telephone Company of Joplin vs. The Sarcoxie Telephone Company, for $10,000 damages and an injunction restraining the Sarcoxie company from further connection with the Bell.

The Home Telephone Company of Joplin was assisted by other independent companies in Missouri, while the Bell company aided the Sarcoxie company. The Home company lost the case in the Circuit Court and the Court of Appeals, but the Supreme Court reversed the lower courts and gives a clear-cut decision in favor of the independent companies.

In 1905 the Kinloch company of St. Louis, the Kansas City Home company, the Home company of Joplin, and the Home company of St. Joseph entered into agreement with each other and with all connecting companies. These agreements were designed to furnish state-wide competition in the long-distance telephone business in Missouri against the Bell lines and were so drawn as to keep the Bell company from putting its lines on the switchboards of the independent companies or from purchasing any of these independent companies or in any other way seeking to disrupt the independent association or stifle competition. The Bell company had succeeded in getting connection with several of the independent companies, hence these suits. The defendant in this case seeks to have the contracts declared invalid as a combination in restraint of trade, but the court holds that the contract furthers competition, saying:

"These connections in the end furnish one continuous competitive line with that of the Bell company and this competition might be broken down if it shall be said that physical connection with the Bell company must be made by all companies having connection with the Kinloch system. The contention has never been in this court and it is a matter of vital importance. The Bell company is apparently seeking to reap where it hath not sown and this under the guise of the law."

Commission Notes from Washington

The Public Service Commission of Washington recently held a hearing of the Bell Telephone Company regarding service given in Lewis county, which will bring up before the commission the question of its rights to order physical connections between rival but non-competitive telephone companies. It is thought the case will be taken to the Supreme Court as it involves the question as to the extent of the powers of the commission. As set forth in the complaint, the Bell company refuses to allow the subscribers of an independent company at Silver Creek to obtain connection with Winlock, Chehalis or Morton, and as a result the independent subscribers have no long-distance connection whatever. It is charged that at one time they were able to secure service with the Bell company at Winlock and Chehalis and were able to reach Tacoma by long-distance from Morton, having connection with the small independent companies running west from the latter place. It is now alleged, however, that the Bell company has ordered the independent company out of Morton to cease doing business with the company at Silver Creek and the company has complied. As a result of Silver Creek being cut off from Winlock and Chehalis, subscribers are unable to reach any point with which they are not directly connected.

A cable 56 miles long, the longest submarine cable in the world, will be built by the British Post Office from Holyhead to Ireland. One cable containing three wires will be used.

What One Woman Thinks

By Sarah Elizabeth Brown

I PRESUME it would be far more interesting if I told you the number of quarts of cherries I had put up and how; that there are eighty-two dandy yellow-legged spring chickens perambulating about the front and back yards—the barn lot and the orchard; that the pints of gooseberry jam have the same tendency to put an edge on false teeth this year that they had last year; that new apple sauce is the hardest thing to keep on the table since I have had the opportunity to invade the 1911 crop.

And then there was the annual Sunday School picnic—my, but we had a time that day! I would like to dwell at length upon the events. I am better equipped to prattle on the rattle of tin pans than I am to discuss telephone topics, if you haven't already found it out.

But, there is always something to say on any subject, especially if a woman has her inning. I know it is an old joke, but it is true. I have been encouraged to have my say—I have been dabbling around in this game for a long time and when I mail this batch of copy I will have finished a full three-volume apprenticeship. Why, I can almost qualify for membership in a city press club!

* * *

There is something radically wrong with the commercial world. We feel it on the farm and just as quiet as you care to keep it, there is a tendency this year to let employees of the telephone company have as long a vacation as they want, and no questions asked. The old-time vigor of events seems to be lacking. You can feel it in the air. For nearly a week during the month, our wind-wheel didn't turn around. We had to pump water for the stock. Even the little pin wheel that we put up on the gate post for Dolly Kettring, my neighbor's little daughter, refused to budge. And hot! The only relief we had was a splash in the creek.

* * *

Whether these signs have anything to do with it or not, they are the only ones that I see with my two good eyes. The rest I read and if you set out for optimistic dope in the papers your eyes will be tired before you find it. Probably the attorney general of the United States will get to the end of his long campaign or the people themselves will get used to his sharp stick, but that he is one source of trouble can't be denied. Then there is that awful stock list that must be maintained. The water in it has to come out and the big fellows are hoping to let go at a profit as the little fellows pick up the remains. Let us all be thankful that the little fellow isn't the old-time sucker. The little fellow who has managed to put by a thousand or two is hiking back to the dear old farm. They have abandoned the notion of getting-rich quick; an old-time method being to buy at the peak and creep out at the low point.

* * *

Then there is the remedy-man. Everybody has a remedy for what ails us, which is the best evidence in the world that something's wrong, and the most pathetic figure we have at this explanation performance is the country banker. When a country banker is forced to loan his money on chattels or not loan it at all, he is ready to throw a fit at the crook of a finger. And country bankers will never recover from the shock that farmers own automobiles. The farmer ceased to be the banker's idol when he paid off his farm mortgage. The telephone game gave some of the farmers another chance to borrow money from the local banker, but that obligation has invariably been paid. Ever stop to think, my brother, that the telephone has offered the farmer his only chance to engage in side-lines? The owner of a threshing outfit may have aspirations to a commercial career, but he can hardly qualify with telephone operators as a class. And unless he was phenomenally successful, he wouldn't have occasion to meet a bond face to face. But if he was a successful thresher, he couldn't find a better investment than telephone securities if he tried. Speaking of threshers, do you know that they have the trust bug? In our country, every owner of an outfit attended a meeting June 10th and agreed to the last mother's son to raise the price from three to four cents a bushel. I guess Mr. Wickersham will be busy for some time to come if he expects to prosecute all the combinations that are plotted against the plain, common people.

* * *

The thing that bothers me, though, is the apathy of the telephone business. Is there a telephone man in this country who will rise up and say that we have reached the saturation point? Why this silence? Who is that party out there who snickered? Very well then, we haven't reached the maximum—there is room for hundreds of thousands of new telephones. Who is going to make them and who will sell them? And let us suppose that there wasn't a chance to crowd in one more station anywhere in all the world. Who will make the replacements?

* * *

The factor of obsolescence hasn't been mentioned. The most conservative plant depreciation figure is placed at 8 per cent. That means that the telephone plant's average life is twelve years. It doesn't mean that twelve years from today there will be a whole new equipment for our telephone system, but it means that it will have cost us the present value of the plant to maintain it till 1923, providing we did not add a single customer. Who will get the $150,000 we are going to spend?

* * *

If the truth were known, right now there isn't a manufacturer of telephones in the world who will not fall short of his 1910 output. It has been a hard proposition to teach the public that the larger the system, the greater the expense to new subscribers. It would be a still harder problem to satisfactorily explain to me why the telephone manufacturing business should not be better every succeeding year. The constantly growing total; the extraordinary depreciation of construction materials and equipment; the obsolescence; the hazards, all encourage that belief. And

with hardly an exception, so far as I know or care to learn, there is discontent among the manufacturers of telephones. The operators of plants seem to have planned more wisely, because there seems to be far less complaint and other evidences upon which to make deductions.

* * *

Isn't it a sensible conclusion, then, that there is something wrong with the scheme of manufacturer and operator attempting to promote mutual interests by joining hands in a common cause? After all, are our independent telephone associations the panacea for the real or imaginary ills? It has long since been known that the independent manufacturers of telephone apparatus have supplied the bulk of the various association munitions. As a reward for their bequests they have doubtless become more or less peeved because the returns did not justify the outlay. If there is an merit in organization it should work out ultimately on the profit side of the ledger, but it is my guess that this arrangement isn't doing it. Sometimes it pays to get a long ways off from the seat of operation and have a bird's-eye view. That's what I am enjoying right now and I believe I can see things at the right perspective.

* * *

Take Ohio for example. If the telephone manufacturers in that state had been putting up for "the good of the cause," it surely hasn't had much comforting effect. J. P. Morgan & Co. has ridden roughshod over the independent interests in the Buckeye state and it hasn't cared a picayune whether the associations of independents had a constitution and bylaws or not. Morgan bought what he wanted at the price he was willing to pay and he will sell everything he bought if he can get out at a profit. He failed to ask the aid or consent of any mutual admiration society. For proof, see Ohio papers, which are bubbling over with all sorts of wild statements about what is to become of the old telephone policies. Some of these stories talk a measured meter system for all companies; others that the automatic will be abandoned; still others that auto-manual will prevail throughout the state. One article, in the Columbus *Dispatch*, alleges all these things and more, the reporter scoring a big hit over his rivals!

* * *

Well, what about Ohio, you fellows? Will it help the independent telephone manufacturing business? I fear not. But then there is commission control down there, and I'm wondering how many telephone men know the commissioners. These commissioners are just ordinary men chosen for their fitness for these posts of duty. The laws of this country are intended to be fair and equitable. There is a way for telephone manufacturers to get as much business today as ever, and if all the signs are true, they would be getting more business today than ever before.

* * *

It isn't the time to sing the swan song for the telephone business. Nor is it the time for manufacturers of telephones to divert their attention to the making of other things. I wonder if you know that there is only one manufacturer of telephones in this country that has been concentrating on that single thing while every other manufacturer of telephones has been grubbing for specialties. And I guess that will go a long ways in bearing out my point of contention. I wonder, too, whether you might have noticed that the one concern which got rid of its specialties is doing less "hollering" than those that have been taking them on.

* * *

The thing that is the matter with the telephone business can be found under the hats of not more than twenty men, all closely allied to an association that is nursing a forlorn hope.

Michigan Men Discuss Giles Law

The independent telephone interests of the state of Michigan held an informal conference July 10 in the Board of Trade rooms at Grand Rapids to discuss the operations of the Giles law, which will go into effect in August. E. B. Fisher, president of the state association, presided, and the burden of explaining the law fell upon the Grand Rapids delegation. The law provides that when any party at interest shall apply to the state railroad commission the commission shall investigate conditions and may order competing telephone companies to make physical connections and interchange business on a charge basis of 5 cents for each connection made. The law also sanctions the merging of competing telephone companies when sanctioned by the state commission which has supervision over the rates and methods of doing business. A further provision is that telephone companies shall not discriminate in any way between patrons, not giving rebates, discounts or special favors. Some of the visiting managers at the meeting had not even read the bill and some of them had unique ideas as to its provisions. After the explanations had been made and the situation discussed it was decided the attitude of the independents would be friendly. There was no talk at the meeting of possible mergers with the Michigan State Company. After the meeting C. D. Boyd, local representative of the Kellogg Switchboard and Supply Company, entertained a party at dinner at the Pantlind hotel.

Demonstration of Submarine Telephone

Visitors at Venice, Cal., recently witnessed a demonstration of the use of the submarine telephone. Captain Al Christie, one of the best known deep sea divers on the Pacific Coast, who with Al Burton, his assistant, has been doing some submarine work around the Venice pier, recently sent east for a telephonic attachment for his armor.

The telephone was placed in position in the helmet of Burton's suit. Christie took personal charge of Burton's life line, and with the head-piece of the submarine telephone in place, directed the work of his assistant thirty feet below the surface of the ocean.

On coming to the surface Burton declared that he not only could hear the voice of Captain Christie distinctly, but also the talking of other persons around the captain.

The apparatus consist of a separate transmitter and receiver for the man handling the life line and air tube of the diver, the receiver being held in place by a head-band such as is used by operators. The transmitter may either be fastened to the head set, or held in the hand. Inside the diver's helmet a combination transmitter and receiver is placed, close to the mouth of the diver, so that the latter may converse with the man on the surface without interrupting his work beneath the water.

Digest of Foreign Telephone Literature

Translated for Our Readers

DISTRIBUTION OF ENERGY IN TELEPHONE CIRCUITS.

IN trying to improve the efficiency of long-distance telephone service, the chief emphasis has been placed on the improvement of the receivers, transmitters, and especially the telephone conductors and wires. Marked results have been achieved in this line, but, strange to say, very few experiments have been made with the view of ascertaining the distribution of electrical energy in the telephone circuits. The few investigations that were made have been restricted to the apparent resistance of the alternating circuits. The receivers and transmitters have also been minutely studied, bringing out the losses and remedies for same. The following article shows the results of careful investigations on the distribution of energy in telephone circuits, and the energy losses sustained in the various parts of telephone service. For the measurements the instruments were excited by alternating current of a frequency equal to about 5,000, or exactly 800 periods per second. The reason for this choice is the fact that the quality of sound transmitted can be judged accurately when, instead of the real telephone current, a continuously alternating current of the above frequency is used. All the measurements are based on a common battery system, which is very common in telephone work.

The first case is the only one where the telephone is used as the receiving station. We compute first the effective current sent to the apparatus. The tension, allowing for change of phases, multiplied with the current in the intervening conductor, gives the amount of effective energy sent to the apparatus.

	10^{-6} watt
Loss in microphone	35.3
Loss in alarm bell	0.84
Current sent to spool	14.0
	50.14

On the other hand, the total current and terminal voltage gives the energy sent to the apparatus as 49.70×10^{-6} watt. The slight difference between the computed theoretical and the actual practical values shows the accuracy of the tests. The energy sent to the spool distributes itself through the same and is partly lost in form of heat. The ohm losses are 16 ohms in the primary and 22 ohms in the secondary circuits, and the loss in energy sent to the receiver. A certain amount of energy is left unaccounted for, which may be referred back to the faults in winding the coils, as further measurements proved. A computation of the entire energy distribution in percentages gives the following:

	10^{-6} watt	Per cent
Energy sent through the telephone circuits	49.7	....
Loss in the microphone	35.3	70.5
Loss in the alarm bell	0.84	1.6
Current sent to the telephone proper	9.2	18.4
Losses in primary coil	1.7	3.4
Losses in secondary coil	1.7	3.4
Other losses in the coils or spools	1.4	2.7
Total	50.14	100.0

Only 18.4 per cent of the total amount of energy sent to the instruments is effective in the receiver, the greatest portion of energy being wasted in the loose turns of the spool. The greatest source of loss is the microphone, in whose resistance 70.5 per cent of the total energy is transformed into heat and lost. The other losses in the alarm bell and the spools are, however, within reasonable limits. It was tried to reduce the losses in the microphone by connecting a condenser of two microfarads in parallel with the former, when receiving messages. The microphone can, of course, he dispensed with in listening to messages, and might be short circuited when the telephone is used as speaking medium without trouble. But as there is a considerable amount of resistance, the short circuiting might interfere with the signals in the exchange, which are necessitated by the direct current flow. The effect of such a condenser on the distribution of energy is considerable. With the same e.m.f. for current supply, the following distribution results:

	10^{-6} watt	Per cent
Loss in microphone	10.2	12.1
Loss in alarm bell	0.93	1.1
Current sent to telephone	48.3	57.1
Loss in the spool	25.1	29.6
	84.53	100.0
Efficiency sent to telephone	84.1	

The energy sent to the telephone has increased threefold. This requires stronger current in the secondary and primary circuits, and therefore the losses in the spools have increased threefold. Other telephone systems tested in a similar way gave different results, because the microphone resistance from instrument to instrument varies at different times. One of these instruments gave with the usual arrangement 25.6 per cent of the initial energy to the telephone; with the condenser this value rose to 65.5 per cent. The influence of the microphone can be decreased by giving the primary coil a greater number of turns. One instrument, whose primary coil had 4,000 turns at 80 ohms, had only 1,600 turns at 27 ohms to the coil connected with the receiver. This instrument gave to the receiver without the parallel condenser 54 per cent, with the condenser 74 per cent of the initial energy sent into it.

When using the telephone as a transmitter we meet a new difficulty in the form of the properties of a working microphone. The inactive microphone stands to the alternating current in the relation of an energy consuming resistance. If the microphone is excited by sound waves, it changes the strength of the direct current flowing through it. In this investigation we need only measure the amplitude of the alternating current of a frequency equal to 5,000, when the microphone is excited by sound waves of this frequency. For the test a common battery microphone was excited by a telephone, a continuous current being maintained by an a.c. generator. The microphone was fed by a storage battery of 25 volts over a resistance of 600 ohms. In order to use alternating current of varying strength without changing the feed current, a changeable condenser was connected in parallel to the terminals of the telephone apparatus. To get an idea of the dependence of the e.m.f. on the strength of the exciting direct current, measurements were made with

uniform sound excitations, and feed current strength of 10, 15 and 20 milliamperes d.c. with the results:

Excitation (milliamperes)	10	15	20
E. m. f. (volts)	0.094	0.183	0.257

The e. m. f. increases more rapidly than the excitation current strength, but slower than the energy sent to the microphone. The results of measurements are collected in the following table, and are standard for a 600 km. line of 4 mm. wire:

Efficiencies and Losses.	Arbitrary units.	Notes.
		Microwatts
Efficiency caused by microphone	51,640	154
loss in microphone	11,180	
loss in coil and ringer	5,810	
Total	16,990	
		Transmitter 67.2%
Energy delivered in subscriber's line	34,650	
Energy loss in the same	4,310	
		Connecting line 87.5%
Current to telephone coil	30,430	
Current loss in teleph. coil	6,660	
Current to long distance telephone wires, 500 km. length	23,680	Translator 78.3%
Current to exchange at end of 500 km. line	848	Long distance line 3.6%
Current loss in coil	234	
		Translator 72.5%
Current to second telephone party line	614	
Current loss in second telephone party line	158	
Current to second subscriber's telephone	456	Connecting line 74.3%
Current loss in microphone	320	
Current loss in ringer	8	
Current loss in coils	43	
	371	
		Microwatt
Current to receivers	85	0.254

The above table shows that most parts, excepting the long-distance line (3.6), have a comparatively high efficiency. The losses on this line, taken in proportion from start to finish, are in the relation of 5:1, equal to 3.6 per cent. Supposing that the transmitter had an e.m.f. of .5 volt, then the receiver of the second party has a current of 46 microamperes, and an efficiency of 0.254 microwatts, while the efficiency caused by the microphone in form of a.c. of a frequency of 5,000, is 154 microwatts. The total degree of electrical effectiveness is only 0.00165. The long-distance line has an effectiveness of 0.036, and the connecting party line wires, added to these, give to the wires a total of 0.0233, leaving 0.071 for the instruments. These figures vary, of course, with the various lines. In improving the efficiency in telephones, the principal idea is to have the final current strong enough to make the words spoken into the telephone intelligible. Differences in this strength are usually balanced by the ability of the human ear to adjust itself to varying conditions. The computations for a telephone circuit must start from the assumption that a certain amount of energy must be transmitted to the second party's apparatus, and it must be decided whether this can be done with the apparatus and equipment available, and whether the e.m.f. available in the microphone of the transmitter is sufficient. When distances are reached where the present type of instruments are worthless, several means of improvement are on hand. Stronger microphones may be used, or else the microphones may be made more efficient. The losses in the various parts of the telephone can be lowered by increasing the efficiency of the different instruments. These improvements are aimed, of course, chiefly at long distance transmission only, and do not take in the local service, which is efficient enough for its ends. Further improvements might be made on the receivers and transmitters. The telephone translators with their 75 per cent efficiency are probably at the highest stage possible, but the lines connected to these can be improved. The receivers and transmitters may give better results, if they are made to transform more of the energy sent into them into sound waves. A parallel condenser might be used to bridge the microphone when listening to messages, and the microphone coil or spool might be wound differently to obtain a sufficient apparent resistance at the end of the line. This resistance weakens the incoming and outgoing current somewhat, but can be counteracted by using a parallel condenser in the transmitter as well, connecting this in parallel with the coil, however, and not with the microphone. Since the conversation goes back and forth between the two instruments, each one is now transmitter, now receiver, and arrangement need only be made that the microphone be bridged, when listening to a conversation, and the spool be bridged when speaking over the line. Tests with such an arrangement gave a marked increase in sound, the improvement being in the relation of 1:1.78. The present type telephone is good enough for considerable distances and will not need great improvements as yet. But the tendency is to make telephone connections over very long distances, and to use long cables to bridge waters, and great improvements are needed for these to make them in any way effective.—*Elektrotechnische Zeitschrift.*

OPERATING RESULTS WITH NEW TELEPHONE SYSTEMS.

Comparisons of automatic, semi-automatic and manual systems are not easy as might be thought, mainly because the manual system does not form one simple unit. Various reports have been made comparing the three systems, but none seem to have taken any account of the so-called distributing system, which, however, is the one that can claim lower operating costs than the regular manual system. In Rotterdam such a distributing system, at present, with a multiple panel for 8,400 subscribers, but with space for 18,000 call numbers, has been in use since 1908. This system is comparatively new, but is not of the two-wire but the three-wire type. Ericsson is the designer of this system. The Rotterdam is of the common battery type. The idea is to distribute the telephone calls as uniformly as possible among the staff of operators, so that none of them will be overloaded with calls. The exchange is in two sections. The first has two switchboards with call signals, operators answering keys and plugs. The second one has speaking keys and alarm bell signals, multiple jacks, connecting plugs and cords. The first section, which Aven calls the distributing exchange, serves to distribute the calls received, to those operators on the connecting section, who are not busy at the time. These latter operators call up the desired lines and make the connections. The distributing operator can tell by the signal lamps whether an operator's line is busy or not. A white lamp shows that no line is busy; a green light shows that one line is busy; and a red light, that all available lines at that station are busy. The results obtained with this system will be briefly described. Aven pointed out some time ago that with this arrangement the number of multiple switchboards can be greatly reduced, as each operator can make more connections. The question for the economical operation of this type is, how many distributing operators are

necessary to lower the necessary number of connecting operators. The ratio found by practical experiments is 10 distributing to 26 connecting operators. The periods necessary to answer a call are divided into three parts. The first period, comprising the time from noticing the call signal to selection of an open operator's line, including raising of the answering plug, takes 1.9 seconds. The second and third periods comprise the time for insertion of plug (one second), and breaking of connection (3.4 second), a total of 6.3 seconds for the entire cycle. At the connecting board the first period from observation of call signals to inquiry by operator is 1.8 seconds. The second period from time of asking desired number, testing and plugging of jack of desired line to calling the latter subscriber is 6.6 seconds. The third period embracing time of disconnecting is 8.2 seconds, making a total of 16.6 seconds for the cycle. The relation between the number of operators at both switchboards should be as 6.3:16.6, which is equal to 10 : 26. These proportions can be improved with the increasing efficiency of the operators. Later tables show that the relation of distributing to connecting operators has decreased to $3.1+3.9\times7$: $3+6.1+3.4=12.5$ seconds, making the relation 7 : 12.5 and 10 : 17.9. The latest reports taken in 1910 give even better results, due to the efficiency of the operators, gained through long practice. The tables also give an idea of the number of calls answered by the various operators. A distributing operator can answer 864 calls in one hour, keeping in mind that this number in exceptional cases can be raised to 1,000 calls. Another operator who answered 603 and 644 calls in one hour showed, however, results of the strain, whereas one operator, who answered 500 calls in the same time, showed no strain at all, and did not seem to think that this was exceptional.

Comparing such a system now with the automatic system (Strowger), we must remember, first, that the regular smooth working of the telephone here depends on the public and not on trained operators. Tables taken at Rotterdam with the manual system, just described, showed that the first half year the operators cut in on busy wires only 0.35 per cent, and in the second half year only 0.24 per cent, being a very good record for inexperienced operators. Disconnecting wrong lines, the next most common mistake, was 0.37 per cent in the first half, 0.31 per cent in the second half year of operation. These figures are, of course, much smaller at the present, due to the excellent training of the operators. Such mistakes would not be liable to occur in an automatic system, but, on the other hand, the public is liable to make other errors. Tests in Hildesheim with the manual system show that about one per cent of all the telephone calls made within 15 minutes were wrong. The time taken to call a subscriber is longer in this system, the increase being from 8 to 12 seconds over the manual system. The time taken by an operator to connect subscribers is about 12.2 seconds on the average; for automatic systems this is 14 to 21 seconds. The author compiled tables from tests with 100, 1,000 and 10,000 systems, and found that time necessary to make connections is 5.7, 7.1 and 9.4 seconds respectively. If we consider, however, how long it often takes for a subscriber to answer his telephone, and how quickly connections can be made and broken by either system, it is hardly fair to make a comparison between the two systems favoring one or the other. If we suppose Herr Grabe's contention to be correct, that an automatic 10,000 call system takes 10 seconds to make connections, whereas a manual system takes 16 seconds, then the automatic system would be far ahead of the manual system, provided the telephone subscriber always answers his telephone promptly, which is not the case. Actual practice shows that the time consumed before two subscribers can talk to each other is about 25 seconds, so that the automatic system is not so far ahead of the manual system as appeared at first.

Much has been written about the relative cost of operation of both systems. But the zeal of the automatic telephone advocates has led them too far and has made them charge too high figures against the manual system for the operators. The facts show that the operating costs are not so overwhelmingly in favor of the automatic system as might be supposed. Moreover, one of the alleged drawbacks to the automatic system is the fact that the public is made to do the work of the operators, and the experience, in Sweden at least, is said to be that the people prefer to have the schooled operators make the connections rather than choose their own selectors and make their own connections. Finally the telephone exchange question is also of importance. Where there are several sub-exchanges, as in large cities, the automatic and semi-automatic system is perhaps the better. Where, however, conditions are such as to dispense with sub-exchanges, and have all the connections made at the main exchange, the manual system is the better, and will be so for some time to come.—*Elektrotechnische Zeitschrift.*

Indiana's Telephones

Figures compiled by the Indiana State Board of Tax Commissioners show that there are 261,405.18 miles of telephone lines in Indiana which will be entered on county tax records. The total assessed valuation of 800 companies will be $12,326,581, according to the report. None of the telephone lines are leased for telegraph use.

The total number of miles through each county which the various companies control and the assessment a mile on each line will be sent to different companies as soon as the board's work with regard to the telephone and telegraph companies is completed.

The Central Union Telephone Company leads the list with 101,562½ miles and an assessed valuation of $3,554,679. The American Telephone and Telegraph Company is second, with an assessed valuation of $2,004,736 on 31,324 miles of line. The Indianapolis Telephone Company is listed as having 7,379.15 miles of line, with a taxable value of $811,706.

The Citizens' Independent Telephone Company of Terre Haute has an assessed valuation of $286,021 on a total of 3,010¼ miles of lines. The Cumberland Telephone and Telegraph Company shows a total mileage of 15,041¼ within the state, and its taxable valuation is placed at $601,670. The Home Telephone and Telegraph Company of Fort Wayne will be assessed on a valuation of $329,730. It has a total of 1,137 miles.

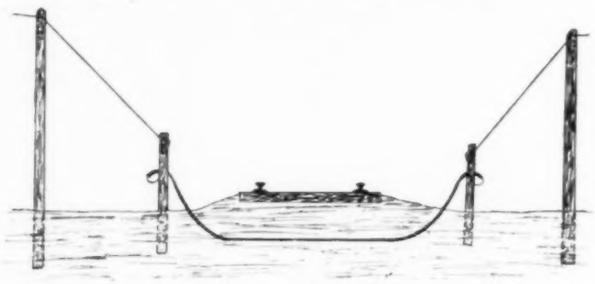
The Lafayette Telephone Company has but 660 miles of line, and its assessed valuation is $115,500. The New Long Distance Telephone Company shows 8,185 miles of line, and its valuation is rated at $368,325. The Richmond Home Telephone Company has 845 miles of line and its assessed valuation is $126,750.

The South Bend Telephone Company is credited with 1,616 miles of line and its taxable valuation is $323,200. The United Telephone Company has an assessed value of $256,312 and a total mileage of 4,134.06.

The Telephone Scrap Book

Railway Crossings

TO the average telephone company doing a rural business, and which has had to make crossings over railways with its wires, this subject will be of some little interest, especially if any of these companies have had to pay tribute, in the way of damages, to employees of railways for injuries sustained on account of wires sagging so low over the track—due to neglect in the way of line supervision, sleet overloads, or perhaps a wire coming off of pin or bracket—that



Carrying Telephone Wire Beneath Tracks.

some unfortunate has been unceremoniously swept off a passing train and thrown to the ground with more or less serious results. Owing to the fact that one company had some of this experience some eight or nine years ago it was concluded that overload wire crossings were too risky and steps were immediately taken to evolve something better with the result that all rural crossings were changed to conform to the layout shown in accompanying sketch.

To make the crossing shown in the sketch weatherproof wire was taken and on this insulation was wrapped an extra safeguard and insulation in the way of four layers of good friction tape, being careful to wrap it on the wire for a sufficient distance to allow it to project several inches beyond each terminal end of the pipe, which was usually ⅜ inch galvanized iron gas pipe, in which it was incased. Next a trench was dug underneath the railway track to a depth which would allow of the pipe being buried underneath the rails at least three and one-half feet. After this trench was dug, which must project either side of the track for a sufficient distance to allow of the pipe ends being brought out without their being in the way of section men, etc., measurements were taken to ascertain the length of pipe needed, which would be the length of the trench plus enough, at each end, to allow the pipe to project from the surface of the ground four or five feet. The next step taken was the placing of the insulated wire within the pipe, after which the whole thing was placed within the trench, each end of the pipe being bent to allow its conforming to the trench. After thoroughly refilling and tamping the trench, the next operation was to bend a "goose neck" on each projecting end of the pipe, this end being then fastened to a short post—for protection—and the wire contained within it is then ready for line connection as shown in the sketch mentioned. Although quite a number of these crossings have been in use by the company for the last eight or nine years, it has, as yet, never had any trouble with them, and has never had to think about its railway crossings with any fear of doing anyone an injury.

Strength of Western Cedar Poles

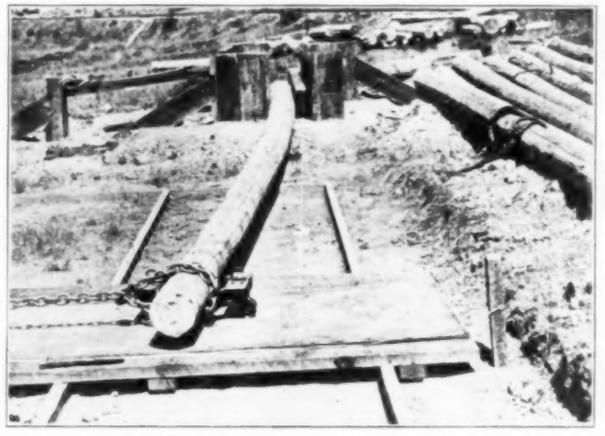
THE results given below were obtained from a test on eighty poles divided as follows:

30 western cedar poles from Idaho.
27 western cedar poles from Oregon and Washington.
23 Port Orford cedar poles from the western slopes of Oregon.

These poles were stripped of bark but had the natural sapwood.

Modulus of rupture	Moisture Content per cent	Sapwood % of total area	Rings per inch	Weight per cu. ft. lbs.	Load at failure
WESTERN CEDAR FROM IDAHO.					
5268.53	10.1	26.254	20.324	22.741	2214.31
PORT ORFORD CEDAR.					
7218.38	12.016	.....	15.99	26.654	3039.43
WESTERN CEDAR FROM OREGON AND WASHINGTON.					
5353.185	15.152	33.99	11.933	21.947	1928.666

The results obtained from Port Orford cedar were very consistent and uniform. The wood is about 17 per cent heavier and 27 per cent stronger than western cedar; of fine uniform grain and seems to contain few defects outside of severe weather checking. The taper of the Port Orford cedar is slightly less than that of western cedar. A comparison between the strength



Testing the Properties of Telephone Poles.

of western cedar from Idaho and western cedar from Oregon and Washington districts is difficult to make. A comparison of the conditions of the two western cedars showed everything to be in favor of Idaho cedar; Idaho cedar had lower moisture content, lower percentage of sapwood, greater number of rings per inch, greater weight per cubic foot, and yet it is the weaker of the two; the heavy checking and the shattering at failure of Idaho cedar giving evidence of very

severe treatment in seasoning, and is undoubtedly the key to this inconsistency. A proper and systematic method of seasoning would have undoubtedly increased the strength of these poles considerably. The effect of these conditions upon the strength of the conifers has been thoroughly investigated by the Forest Service, results of which are given in Bulletin No. 10, and Circular No. 108.

The bond between the annual rings in western cedar is extremely small. The pole generally failed in successive layers on the tension side, failing almost entirely by tension. After complete failure the pole was generally badly shattered, and often long troughs extending the whole length of the tree and one-third of the circumference would drop away.

The data shows that poles of rapid growth contain the greatest per cent of sapwood, the most knots, and are generally checked more severely than others. Experience shows a rapid growth tree to be less resistant to decay than the slow growth.

Sapwood as is shown in the table represents between twenty-six and thirty-four per cent of the total area of western cedar poles. Curves plotted of the failure of these poles showed that sapwood represented about twenty per cent of the strength of the pole.

Hand Generator Characteristics

AN article by H. P. Clausen in the *Electrical World* gives some results of a study of the characteristics of an alternating current delivered by a hand-driven generator. Fig. 1 shows the current produced by two generators exactly similar in so far as magnetic strength and windings are concerned, with the only difference that curve *B* shows the emf wave-form of a generator having an air space of 0.023 in. between

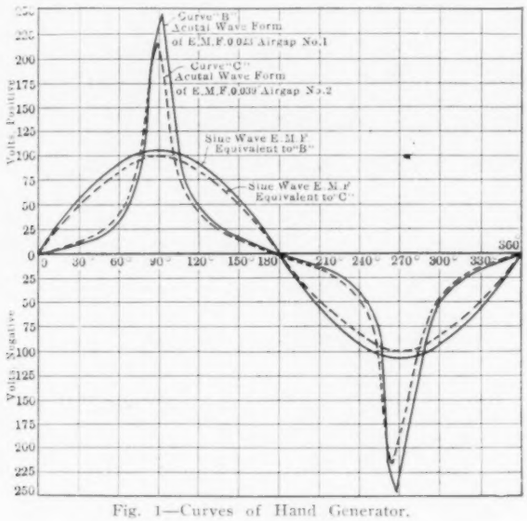


Fig. 1—Curves of Hand Generator.

the armature and the pole piece, while curve *C* shows the form wave when the same generator is provided with an air-gap of 0.039 in., the former curve being produced by machine No. 1 and the latter curve by machine No. 2.

In reducing the results of the direct measurement of the emf of the No. 1 and No. 2 machines it was found that while these machines are of standard construction, and, therefore, known as the regular 80-volt generator, the No. 1 machine, with the smaller air-gap, delivered about 245 volts at its highest emf, while the No. 2 machine, with the larger air-gap, had a maximum emf of 215 volts. In order to make the voltage measurement it was necessary to provide a contact upon the armature through which the voltage during a given instant could be measured. In order to accomplish the measurement a source of direct current was opposed to the current generator and when absolute balance was had in the potentials of the two sources current

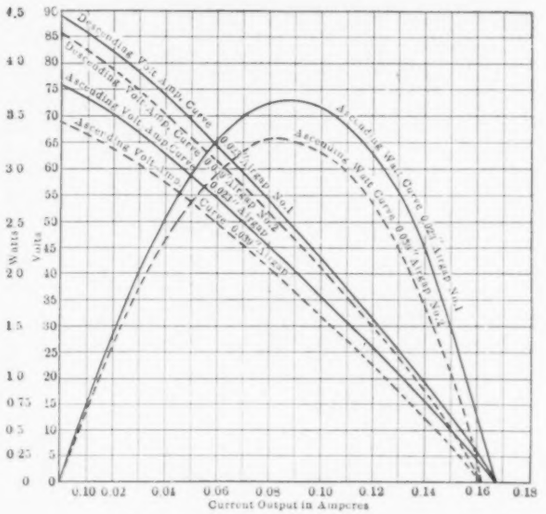


Fig. 2—Output of Two Machines.

ceased to flow from one to the other and the emf of the opposing source of current was accepted as being equal to that generated by the armature at a given position. Upon reducing the emf curve to a sine-wave equivalent machine No. 1 produced the sine-wave *B* and machine No. 2 the form *C*.

In Fig. 2 tests of the actual current output of the two machines are shown so as to compare the effect of the difference in the air-gap and the difference in the current delivered by the machines after they have been subjected to the demagnetizing influence of driving the machine with the armature windings completely short-circuited.

It will be observed that machine No. 1, having the smaller air-gap, starts in with a voltage of 89, or a voltmeter of 1,500 ohms. Gradually increasing the load upon the generator while driving it at 1,000 r. p. m., it is observed that as the current delivered increases the voltage drops until we arrive at a total current of slightly over 1.1675 amp. Now, without changing the conditions in any way, the load was gradually removed, with the result that when finally reduced to the voltmeter resistance, generator No. 1 delivered current at something under 76 volts. In other words, after building the generator, and subjecting it to the short-circuiting operation, it was found to have dropped something under 15 per cent in the voltage which it was capable of generating.

In order to observe the effects of the larger air-gap machine No. 2 was started off at about 85½ volts and did not quite reach the 0.1675 amp. point of machine No. 1, stopping at 0.161 amp., and, upon ascending, the voltage finally rested at slightly under 69, which gave a reduction of voltage of 19½ per cent.

From the tests described it will, therefore, appear that since it is impossible to prevent short-circuiting a generator winding while it is being driven, we find the No. 1 machine at the beginning is about four per cent better, from a voltage standpoint, than the No. 2 machine, and that, after having been short-circuited, it is about nine per cent better. It, therefore, is quite obvious that if an air-gap of 0.023 in. can be maintained efficiently from a mechanical standpoint, it will produce a generator about nine per cent better than the machine having the larger air-gap. Reducing the voltage and ampere line to a watt curve, we are interested, particularly, in the ascending curve, *A* showing the No. 1 machine curve and *B* the No. 2 machine curve, from which it will be observed that the small-air-gap machine is about 11½ per cent better than the machine provided with the larger air-gap.

Difficult Locations for Anchorage

THERE are many times in the construction man's experience when he is hard pressed to obtain a safe anchorage for his pole lines because of the peculiar conditions he must overcome. The accompanying

A Difficult Anchor Location.

photograph shows such a case. The owner of the property refused permission because of his fine lawn and rose bushes, which he was sure would be damaged by even the most careful digging. The problem was solved by proving to the property owner that a screw type anchor could be inserted without digging any hole and without injury to his bushes or lawn.

In another case an important line had to be anchored on a long bend. It was impossible to secure permission to put down an anchor of any kind inside the fence; and digging a hole between the fence and the sidewalk would have been impracticable. The guys had to be clear of the walk, which was arranged by extending a truss arm out from the pole over the walk and using a vertical guy from the end of the arm. The screw type anchor also solved this problem.

For the photograph and data, which were obtained in St. Louis county, Missouri, we are indebted to Claude L. Matthews.

Improved Insulators

IN the course of a paper on "Line Conductor Requirements for Telegraphic Transmission," read at the annual convention of the Association of Railway Telegraph Superintendents, Frank F. Fowle spoke in favor of improved insulators.

The advantages of better insulation, he said, have been demonstrated. The means of securing it will be

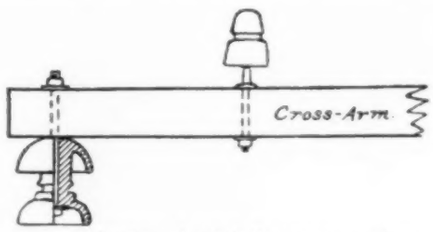


Fig. 1—Insulator Located Beneath Cross Arm.

discussed briefly. There is already some experimental evidence, although not extensive, that glazed porcelain makes an insulator superior to glass. But one of the prominent faults of the standard glass insulator is its form, coupled with the method of mounting it. Dependence for insulation is placed primarily on maintaining a dry interior under the outer petticoat, but this fails of realization on account of spattering of water (during rainfall) into the petticoat from the top surface of the cross-arm beneath the insulator.

A superior method of overcoming this appears to be the use of an insulator placed beneath the cross-arm and held by a rigid pin, after the plan shown in Fig. 1. This removes the objection of spattering from the arm and is mechanically just as rigid as the present standard; a large under flange is employed to prevent the tie-wire from shipping down.

A more radical proposal is the use of a flexible suspension with a strain insulator of the type shown in Fig. 2. This plan is suitable for straight portions of pole line and owing to its flexible character will tend to reduce wire-stripping in a heavy sleet storm. The insulator itself is suspended from the cross-arm by a

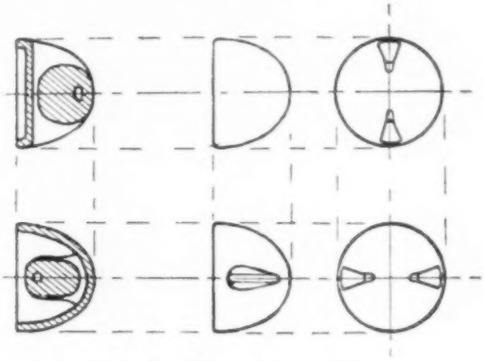


Fig. 2—New Type of Strain Insulator.

loop of wire, and the line wire is supported in turn from the insulator by means of a tie-wire. Attention is called to the form of tie, which is wrapped around the line from each side toward the center, in opposite directions, with the ends pig-tailed at the center; it is practically impossible for it to fail except by fracture. These plans for improving the insulation, and

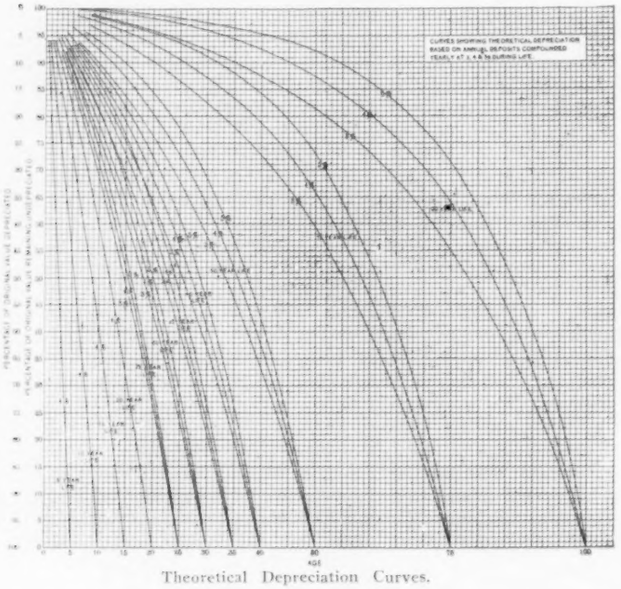
others, are discussed in the other paper before the American Institute of Electrical Engineers, more fully than space permits here.

Theoretical Depreciation Curves

DEPRECIATION is rather a complicated subject, and any addition to its literature is valuable. A paper by Henry Floy was read before the annual convention of the American Institute of Electrical Engineers which discussed the subject very thoroughly, and it will be abstracted in a later issue of TELEPHONE ENGINEER.

The accompanying plate is taken from Mr. Floy's paper and shows the theoretical value of depreciated property at any year in its life. As 3, 4 and 5 per cent are rather common rates of return on funds allowed to accrue with interest, the curves on the plate are given, indicating the values in percentages that obtain at any given time for apparatus having lives varying from 5 to 100 years. The abscissa graduated from 0 to 100 indicates the age, the ordinates 0 to 100 indicate either the percentage of depreciation to be subtracted from the cost to obtain theoretical present value or the percentage of the original value direct. To use the curves, start from a point on the abscissa indicating the life already expired, follow the vertical until it intersects with the curve marked with the assumed life of the property being considered, then follow the horizontal to the left and read from the ordinate the percentage of depreciation or the remaining present value as may be desired.

The fund that will accumulate at the end of any number of years through the annual laying aside of a



Theoretical Depreciation Curves.

uniform amount and putting that out at compounded interest, is determined by the following formula.

$$F = D\,\frac{(1+R)^N - 1}{R}$$

The sum to be laid aside annually at compound interest to accumulate a given amount at the end of a number of years is determined from the following formula.

$$D = \frac{F\,R}{(1+R)^N - 1}$$

where F = the accumulated amount in dollars at the end of N years.
D = the annual amount of dollars laid aside at interest compounded every 12 months.
R = the annual rate of interest expressed as hundredths of a dollar.
N = the number of years the amount is annually laid aside.

Kinds of Cable Trouble

THE various kinds of telephone cable troubles are illustrated in the accompanying sketch, which is borrowed from an article in *Popular Electricity*, entitled "Underground Telephone Cable Splicing," by George

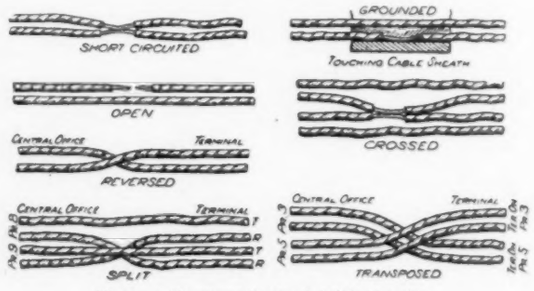


Diagram Showing Kinds of Cable Trouble.

M. Peterson. The first sketch at the left shows a short-circuited pair. The next shows one wire of a pair open. The wires of a pair are reversed in the next drawing, while the left hand bottom sketch shows a split between two pairs. At the top, on the right, is shown one wire of a pair grounded by being in metallic contact with the inside of the cable sketch. Next is a cross between adjacent wires of two pairs. Below that is shown a transposition of two pairs of wires. Moisture in a cable causes grounds through the paper insulation to the sheath as well as where the wire is bared. Extreme caution must be used in all cable work to prevent moisture from entering the cable, and a splice should never be left open over night without special orders.

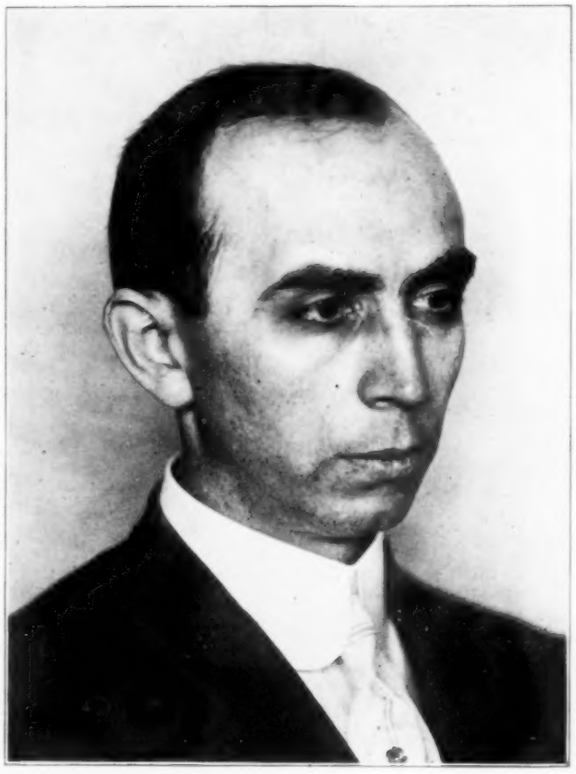
Telephones in Prince Edward Island

Consul Frank Deedmeyer, Charlottetown, reports that telephone communication between Prince Edward Island and the other maritime provinces of Canada is now established. A second cable has been laid across Northumberland Strait, from Cariboo Island, nine miles from Pictou, Nova Scotia, to Wood Island, near Charlottetown. The distance is about 35 miles. This new cable carries telegraph and telephone wires. For the present, direct telephone communication is limited to points between Prince Edward Island and the larger cities in New Brunswick and Nova Scotia. Communication between Charlottetown and points in the United States is possible only by repeating messages at St. John, New Brunswick, and Halifax, Nova Scotia.

Who's Who in the Telephone Game

Facts and Fancies About a Man You Know or Ought to Know

IN an unguarded moment a number of years ago the populists of Kansas elected Sockless Jerry Simpson to represent them in an official way at the national capitol. Forthwith, every male member of the Simpson family who had not previously been named Jeremiah, was dubbed Jerry. It was in these turbulent times when Charles Arthur Simpson, erstwhile of Vincennes, Indiana, but more recently of Chicago, Illinois, was doing time at Purdue University. It happened simply enough. Charles Arthur went to bed in the usual way the night before the Kansas populists perpetrated their national joke and when he met his classmates the next day he was plain, ungarnished Jerry Simpson. Since then the name has stuck to him like lacquer to a binding post.



He Stands Nearly Six Feet, and There Isn't a Brace, an Inch of Strand, or a Grey Anchor in His Equipment.

This particular member of the Simpson family was born at instead of in a nursery. You may grasp the distinction when you understand that C. A.'s father was a nurseryman of large proportions in and about Vincennes. The date of the birth was March 14, 1876. Charles A. had the advantage of some early country school education, but at the age of thirteen years he entered college and from then on till he was twenty he had a regular fill of college life in all its applications and amplifications. His college training was leisurely and systematically acquired, with the exception of crowding out his freshman year at Purdue. In this connection you will please bear in mind that Vincennes, Indiana, is some college town itself and that it claimed four faithful years of Simpson's time. These four years at Vincennes ahead of Purdue would have a tendency to qualify a student of the C. A. Simpson type for a little of the hop-step-and-jump variety of modern education, and it was, therefore, dead easy to blend a freshman and sophomore year into a complete whole, if you haven't too narrow a conception of that "dead easy" thing.

So it transpires that Charles Arthur Simpson graduated from a full science course at Vincennes in the spring of '95, and just to show you that he could repeat and be calm under the spotlight, he graduated from Purdue with a full course of electrical engineering in the summer of '98. In both schools his penchant was for the militia, which nearly got the better of him at the end of his school days, because he went away to war. In civil life, in affairs military, he rose to adjutant, but after leaving Purdue he enlisted with Company D, U. S. V. Engineers. His service for the undying glory of his country was prolonged nine months and he was carried as far away from home as Havana, subsequently being stationed at Ft. Sheridan, Montauk Park, Savannah and Tampa. His military performance brought him the office and pay of sergeant. The experience gave him his first actual engineering practice, because an army requires lots of fussing for its comfort, and the campaign proved interesting and worth while, but it could not have had great value in the career which now engages Mr. Simpson.

For be it known that when the Spanish-American war was over, C. A. Simpson came to Chicago in quest of a job, which he found with the Kellogg Switchboard & Supply Company. His salary was $9 a week, which came to him in the shape of a $5 gold piece and four cart wheels. He was assigned by day to the assembling department and by night to the companionship of Albion Davis Toplif Libby and Raymond Handsome Manson, both of whom are well known as telephone engineers and experts of great ability. In such company the talent of Simpson was quick to assert itself. The assembling department gradually developed into engineering and as the transformation was being effected, these three, Simpson, Libby and Manson, with the help of dear old Brady, managed to snuggle up toward the top of the engineering department.

Jerry never cared for frills. He was satisfied at school to hit the bullseye oftenest, for which he wore a fine assortment of marksmanship medals, and in his profession of telephone engineering his chest, though broad, wouldn't begin to hold his marks of distinction. For twelve years he has been making himself useful to his employer and helping with the evolution of the company's apparatus. Today he is assistant chief engineer of the works in direct charge of the engineering

department. He has a number of patents to his credit —clever little tricks that may be found exclusively in the devices turned out under his exacting care.

Jerry Simpson excels in being steady. He stands nearly six feet and there isn't a brace, an inch of strand, or a guy anchor in his entire equipment. He is faithful twenty-five hours a day—the extra hour for full measure. He has no foibles, no fads. He lives "on the ridge" at Tracy, which makes him a long-distance commuter. In 1903 he married and with his wife and two sons he finds his recreation in Chicago's most beautiful residential district, for Tracy is a full fledged part of the big metropolis.

He is not a member of any clubs. In school he was initiated into the mysteries of the Sigma Nu, the frat that was founded at Virginia Military Academy Institute in 1869, and the gang gave him enough to last him for life.

At peace with all the world, solid with his house, fitting his job as it fits him, loved by his co-workers as he is at home—what more should a man want at thirty-five?

A. I. E. E. Convenes in Chicago

The twenty-eighth annual convention of the American Institute of Electrical Engineers, which was recently held in Chicago, proved to be not only one of the most successful but had the largest attendance of any convention ever held by the society, the registration being 930, including 100 ladies. The program included thirty-five papers which, as a rule, possessed a high order of merit. D. C. Jackson, president, and Gano Dunn, president-elect, were in attendance. Ralph W. Pope, who has held the position of secretary since 1885, tendered his resignation. The entertainment features of the convention were well provided for by the entertainment committee, which had arranged for a number of brilliant social gatherings.

On Tuesday afternoon, June 27, the members and visitors were taken by special train to the Hawthorne plant of the Western Electric Company, where they were the guests of the company at a luncheon.

The Tuesday evening session was devoted to electric lighting and was opened with a paper entitled "The Responsibilities of Electrical Engineers in Making Appraisals," by H. M. Byllesby, Chicago, who held that proper credit should be given to the capitalist, the promoter and the man who is able to influence capital, as well as to the engineer.

Mr. Byllesby was followed by Henry Floy, New York, who gave an abstract of his paper entitled "Depreciation as Related to Electrical Properties," in which he urged more general agreement on the terms used in discussing the subject of depreciation, and recommended co-operation among engineers, manufacturers and service corporations for the intelligent collection and correlation of data on which to base estimates of depreciation.

In opening the discussion on the general subject of depreciation, Bion J. Arnold, Chicago, gave it as his opinion that the public should not only pay the public service corporation the cost of the service rendered, plus a fair return on the investment, but also an additional amount in return for the early hazards and losses incurred in establishing the business. W. F. Wells, Brooklyn, held that the value of property in first class condition, although not new, should not be depreciated for the purposes of rate making. It was pointed out by J. W. Lieb, Jr., New York, that the obsolescence of electrical apparatus, due to advances in the art, may form as important a part of the loss of value as depreciation due to wear. It was suggested by Dr. S. S. Wheeler, Ampere, N. J., that in order to simplify the problem all kinds of depreciation be unified. Emil Leonarz, Mexico City, Mexico, called attention to the fact that while rates are often lowered, they are not raised when lines are extended to reach and develop new territory, at great expense to the corporation. Prof. A. H. Ford, of the University of Iowa, suggested that public-service commissions fix the upper and lower limits, above or below which the commission should take a hand in regulating rates for the benefit of the public or company.

The session on Wednesday morning, which proved to be a very live and interesting one, was devoted entirely to the presentation and discussion of railway papers.

This was followed by one of the pleasant social features of the convention, a luncheon given the Institute by the Electric Club of Chicago at the Hotel Sherman, in which about 500 participated, of whom about 150 were members of the club, the remainder being guests. At the close of the luncheon greetings were extended to the Institute by H. E. Niesz, president of the club. D. C. Jackson, president of the Institute, responded in behalf of that society, commenting upon the success of the convention.

At the Wednesday afternoon session, which was a parallel one, presided over by J. G. Wray, of Chicago, there were four papers bearing on telephony and telegraphy. The first one, an unusually interesting one by Major George O. Squier, U. S. A., on "Multiplex Telephony and Telegraphy by Means of Electric Waves Guided by Wires," was presented by S. G. McMeen, of Chicago, who commented on the extremely interesting nature of Major Squire's invention and the attention it has attracted in the technical and lay press; also on the fact that the patents covering this system have been dedicated to the people of the United States by the inventor. The paper was discussed by Dr. Frank B. Jewett, New York, and Messrs. E. F. W. Alexanderson and J. B. Taylor, of Schenectady, Mr. McMeen closing the discussion.

The abstract of a paper by F. F. Fowle, Chicago, entitled "Telegraph Transmission," was discussed briefly by Messrs. Bancroft Gherardi, New York, and G. D. Shepardson, Minneapolis.

An abstract of his paper, "Commercial Loading of Telephone Circuits in the Bell System," was presented by Bancroft Gherardi. This paper was discussed by E. H. Bangs, Indianapolis; Dr. F. B. Jewett, New York; E. H. Colpitts, New York; E. B. Craft, New York; Prof. G. D. Shepardson, Minneapolis; Allard Smith, and J. G. Wray, Chicago, Mr. Gherardi closing.

"Problems in Telephone Traffic Engineering" was the title of a paper presented by F. P. Valentine of Boston. Those discussing this paper were A. P. Allen, W. Lee Campbell, Chicago, and Bancroft Gherardi, New York. In closing Mr. Valentine stated that recent telephone studies had reduced many things thought to be variables to well-known quantities. This work is carried on with increasing intelligence and great advancement has been made in the last four or five years.

The Law and the Telephone

By E. J. Wenner

ACTION FOR DAMAGES FOR NON-DELIVERY OF A MESSAGE—NON-DELIVERY DISTINGUISHED FROM ERRONEOUS TRANSMISSION AND UNREASONABLE DELAY.

WALTER T. Larsen had taken the civil service examination and had applied for a position as carpenter. His name with others was certified to the commissioner of Indian affairs, from which names the officer was to select a carpenter for the Winnebago Indian reservation. May 12, 1906, the acting commissioner delivered to the Postal Telegraph and Cable Company a message addressed to Larsen, in which the position was offered to him. Larsen did not receive the telegram and on January 31, 1907, started an action against the telegraph company claiming damages for failure to deliver the message.

The telegraph company claimed that inasmuch as the code of Iowa provided that a notice of the claim must be given within sixty days after the cause of action accrued, and none had been given, that plaintiff's right was barred. Upon this phase of the case the Supreme Court used the following language:

Section 2164 of the code provides: In any action against any telegraph or telephone company for damages caused by erroneous transmission of a message, or by unreasonable delay in delivery of a message, negligence on the part of the telegraph or telephone company shall be presumed upon proof of erroneous transmission or of unreasonable delay in delivery, and the burden of proof that such error or delay was not due to negligence upon its part shall rest upon such company; but no action for the recovery of such damages shall be maintained unless a claim therefor is presented in writing to such company, officer or agent thereof, within sixty days from the time the cause of action accrues. The entire omission to deliver cannot be regarded as an 'erroneous transmission'. Is such ommission to deliver included in the expression 'unreasonable delay in delivery?' This expression seems to contemplate a delivery, but after the lapse of a reasonable time within which this might have been effected. If a message is erroneously transmitted or there is an actual delivery, though unreasonably delayed, the addressee receives the communication and is informed therefrom of the mistake or negligence of the company, and under such circumstances it is no hardship to require him to present his claim within such reasonable time as the legislature may require, in order that it may investigate while the facts are fresh, and remedy the irregularity, if any existing, in the interest of the service. But in the case of non-delivery, the addressee ordinarily is not aware of the existence of the message. Only the sender and the company may know of this until after the 60 days prescribed have elapsed, and it would seem unjust to deprive him of all remedy, in the absence of any fault on his part. Only the carrier may be aware of the non-delivery, and it ought not to be permitted to escape liability for negligence by according this statute a meaning which would extend its scope beyond relief for the mischief intended. As there was no delivery, the omission cannot be construed as a mere delay, and plaintiff was not required to present his claim to the company before beginning the action."

The plaintiff testified that had the telegram been received he would have accepted the position. The defendant contends that as government employees are taken on probation that the plaintiff can not recover damages on account of the impossibility of proving that he might have safely passed the probation period and received final appointment. The Supreme Court said: "Whether plaintiff would have been appointed permanently, as well as the period during which he would have served as carpenter at the agency, had he been appointed, is purely a matter of speculation. The most that can be said with any degree of certainty is that the negligence of defendant deprived him of the opportunity of being tested on probation as to his efficiency, and, if he stood the test, then of receiving the appointment for an indefinite time. In either event, there is no way by which to determine the period he might have continued in such service, and therefore no basis on which to determine the damage he suffered because of the loss of the opportunity. Manifestly, then, only nominal damages can be allowed."

The court decided that should the plaintiff desire to remit from the amount of damages allowed all in excess of $1, then judgment should be affirmed with costs to the telegraph company.—Larsen v. Postal Telegraph Company (Iowa) 130 *Northwestern Reporter* 813.

DAMAGES AWARDED FOR HORSES KILLED BY AN ELECTRIC SHOCK—POWER WIRE IN CLOSE PROXIMITY TO TELEPHONE MESSENGER—TELEPHONE COMPANY FAILED TO EXERCISE REASONABLE CARE.

Mark Anthony brought suit against the Cass County Home Telephone Company of Dowagiac, Mich., for the value of a span of horses claimed to have been killed as a result of the negligence of the defendant. The defendant is a telephone corporation and at the time of the accident was erecting a system in the city of Dowagiac. The plaintiff's team was being driven through an alley and when at a point about five or six feet from a guy wire of one of defendant's poles they dropped dead in a pool of water, which had formed during the rain of the afternoon. This guy wire was connected with a messenger wire, which latter named wire was shown to have run in close proximity to a high power wire belonging to the Beckwith estate. It is contended by plaintiff that the current from the Beckwith wire was in some manner transmitted to the messenger wire and in turn to the guy wire, which caused the death of the horses.

The defendant contended that it had used reasonable care in the erection of its wires and on that account was free from liability for the death of plaintiff's horses. In addition the defendant claimed that the horses were killed by lightning, and that the lightning was conducted to the ground through the messenger and guy wire above mentioned. There is no evidence to support the latter contention and in

rebuttal it was shown by expert witnesses that animals could be killed by a lower voltage than man, and, by inference, that the voltage from the Beckwith wire was sufficient to kill animals, but would hardly be sufficient to injure the driver on the wagon.

The court submitted the question of reasonable care in instructions to the jury and the verdict was for the plaintiff for the full amount asked.

Upon appeal to the Supreme Court the question of reasonable care was thoroughly discussed and that court decided that the instructions given the jury by the trial court were proper and that this was a question of fact to be decided by a jury. The judgment was affirmed.—Anthony vs. Cass County Home Telephone Company (Michigan) 130 *Northwestern Reporter* 659.

EXCLUSIVE FRANCHISE ILLEGAL—VILLAGE HAD NO RIGHT TO GRANT SAME.

William C. May brought suit against the city of Gothenburg, Neb., to restrain the municipality from signing order granting telephone rights to the Farmers' Mutual Telephone Company, and to enjoin it from setting up poles, stringing wires or otherwise establishing a telephone exchange or lines in the city, and enjoining the city from passing any ordinance authorizing any person or persons, firm or corporation, to erect or maintain a telephone system for local telephone purposes.

The petition alleges that in February, 1907, the plaintiff was granted an exclusive right to the use of the streets and alleys of the village of Gothenburg for a specified term for the purpose of erecting poles and placing wires for local telephone purposes.

The defendant contended that such an authorization was illegal and void, and that under the laws of Nebraska the municipality could not grant the exclusive use of its streets and alleys to any person or persons. It is conceded by the defendant that certain municipal corporations may grant exclusive franchise, but it is claimed that a city of the population of the defendant has not such authority. Upon this question the Supreme Court used the following language: "The legislature not having given cities of this class the power to grant exclusive franchises to telephone companies, the contract of the city in this regard is so far void, as beyond the power of the city. That being true, the power of the city to grant franchises to other companies cannot be doubted. The wisdom and policy of so doing are for the determination of the city council."—May v. City of Gothenburg (Neb.) 130 *Northwestern Reporter* 566.

TELEGRAPH AND TELEPHONE COMPANIES LIABLE FOR MISTAKE IN TRANSMISSION—CHANGE IN CONTRACT.

In the case of Sherrerd vs. Western Union Telegraph Company (Wisconsin) 131 *Northwestern Reporter* 341, it was decided that the telegraph company became the agent of the sender of the message, that the mistake made by the agent was the mistake of the principal, and that the agent became liable to the sender for damages if such resulted from a mistake in the message. It appears that the plaintiff sent an order to his brokers in New York to purchase one hundred shares of stock at a certain price, and that when the message was delivered to the broker it read one thousand shares instead of one hundred shares. The purchase was made and upon an immediate re-sale of the excess plaintiff sustained a loss of $1,500, and brought action against the defendant to recover that amount. The defendant recovered a judgment in the court below, but the Supreme Court reversed the decision and remanded the case for a new trial on the ground that the defendant became liable to the plaintiff because of the mistake in the message. The plaintiff took immediate steps to reduce the damage to defendant by ordering a re-sale of the excess over the amount ordered. This was sold at a loss and the court held that the plaintiff should have been reimbursed.

DAMAGES FOR DELAY IN DELIVERY OF SICK AND DEATH MESSAGE—MENTAL ANGUISH AND SUFFERING.

While plaintiff was on a visit at the home of his brother in Brookings, S. D., his family physician telegraphed from Stanwood, Iowa, that plaintiff's wife was sick and requested him to come home immediately. Plaintiff's wife died at 12 o'clock of the same day and a telegram calling his attention to the death was delivered to plaintiff at the same time as the one from the physician. Had the first telegram been delivered promptly plaintiff would have been able to take the 11:15 train and would have reached Stanwood twenty-four hours earlier than the train he was finally able to get. The evidence showed the message to have been delivered to the defendant's agent at Stanwood, Iowa, at 4:15 o'clock in the morning and that it was not sent from that office until 10:25 a. m. The defendant contended that its inability to get a connection at Cedar Rapids excused it from liability, but the court held that the fault was not that of the plaintiff, or his agent, and that the message was of such a nature as to require immediate transmission and that the delay was an unreasonable one, and on that account found the defendant liable.

The Supreme Court affirmed the decision of the court below with the exception that it found the sum for $600 to be excessive on the ground that the mental anguish for which plaintiff might recover was not because of the death of his wife or of his inability to be at the bedside and the funeral, but solely because of being delayed for a period of twenty-four hours. The verdict was reduced to $300 and upon condition that such reduction will be accepted the decision of the court below was affirmed.—Maley v. Western Union Telegraph Company, (Iowa) 130 *Northwestern Reporter* 1086.

JURISDICTION OF PUBLIC UTILITIES COMMISSION ATTACKED—BELL COMPANY WANTS TO BE SHOWN.

In the proceedings before the Public Utilities Commission of Kansas, in which the Girard Mutual Telephone Company seeks to compel the Home Telephone Company and Missouri and Kansas Telephone Company to connect long distance lines with its local lines, the latter companies have filed an answer denying jurisdiction. It is contended that the commission has no right to inquire into the affairs of the Mutual Company or render services to a mutual company. Some time ago the Utilities Commission held that a mutual company should be treated as an individual and, if this holding is affirmed by the court, the commission will be able to regulate the business of mutual companies.

DEPARTMENT of RAILWAY TELEPHONES

Convention of Telegraph Superintendents

Report of the Boston Meeting

THE Association of Railroad Telegraph Superintendents held its annual convention at Boston, June 26-30.

Among those who attended the opening session as a guest was Mrs. George S. Minot, of Brookline, Mass., a niece of the late Charles Minot, general superintendent of the Erie railroad, who sent the first telegraphic train order, in commemoration of which event a monument is to be erected at Turner, N. Y. The sum of $1,439.03 has already been raised for the purpose. E. P. Griffith, chairman of the monument fund, introduced Mrs. Minot, who thanked the members for the honor paid her.

I. T. Dyer, Los Angeles, Cal., president of the association, was unable to be present on account of ill health, and in his absence the meeting was presided over by J. B. Sheldon, of Omaha, Neb., first vice-president. A letter was read from Mr. Dyer in which he expressed his regrets at not being able to be present and also referred to the excellent work of the association during the year, mentioning especially the work of the committee on high tension wire crossings. He also suggested that a fixed date be set for the conventions.

The report of Secretary Drew showed the association to be in better condition financially than at any time in its history, having a substantial balance in bank. At the time the report was made up it showed 102 active members in good standing and 67 associate members, making a total of 169, notwithstanding the dues had been increased.

In a speech which was interspersed with humor and was enthusiastically received, Mayor Fitzgerald, of Boston, extended a hearty welcome to the delegates and spoke in complimentary terms of the association. He compared telegraphy and telephony abroad with the service in our own country, much to the advantage of the latter, as he cited an instance in Paris where it took him four hours to get a telephone connection three blocks away in the middle of the night.

W. J. Camp read a paper, entitled "Some Hints," which appears on another page. This paper was followed by a lengthy discussion participated in by Messrs. Griffith, Johnson, Ditch, Caskey, Kissinger, Cellar and A. B. Taylor.

A paper on "Co-operation Between Railroad People and Commercial Companies" was read by W. P. Cline, the discussion of which brought out much valuable information relating to telegraph line construction and maintenance.

J. L. McQuarrie read a paper on "Some Observations on Telephone Transmission," which was characterized by one speaker as an historical and practical discussion on the subject. This paper will be published in TELEPHONE ENGINEER.

The report of the high tension wire crossing committee, presented by G. A. Cellar, was received and approved and the committee continued. The Western Union and Postal Telegraph-Cable companies and the American Telephone and Telegraph Company are to be invited to co-operate in future work in this direction.

A paper on "Railway Efficiency" by R. W. Pope was read by W. W. Ryder and was followed by the report of the committee on form for delivery of messages to trains, etc., by E. P. Griffith, chairman.

F. F. Fowle, of Chicago, read a paper on "Line Conductor Requirements for Telegraph Transmission" which was a very comprehensive discussion of the subject and pointed out the effect of line breakage upon operation, which heretofore had not been given as much consideration as its importance warranted. The effect of leakage was practically demonstrated by means of simple apparatus. Mr. Fowle was followed by W. Tassin, who gave a description of the methods employed in the manufacture of copper-clad wire, illustrating the subject by means of lantern slides

Department of Railway Telephones

This department is established as a permanent feature of TELEPHONE ENGINEER. The progress of the art of telephone train dispatching, its technical development, its news, and the elucidation of its mysteries for the non-technical worker will be found each month in these pages. The editors invite the problems and solicit the co-operation of the many readers of TELEPHONE ENGINEER in all parts of the world whose interests lie along these lines.

Convention of Telegraph Superintendents 87-88
Listening Sets for Dispatching Circuits 88
Telephone Economy in Railway Service. By G. K. Hever 89-91
Five New Telephone Circuits for C. & N. W. 91
Lehigh Valley Extends Dispatching Circuits 91
Railway Appliance Association Meets 91
Some Hints on Railway Telephony. By W. J. Camp 92-93
Foot Switches for Telephone Dispatching 94

showing views of the works of the company manufacturing this wire as well as sections of the copper-clad wire showing the complete union between the steel core and the copper covering.

"Telephone Cable Transmission," a paper prepared by John B. Adams and read by J. F. Caskey, was a very practical discussion of the subject and contained basic rules for the determination of telephone transmission, in non-technical language.

W. E. Harkness of New York read a paper, entitled "Current Supply for Selective Calling Systems," which was discussed by Messrs. J. F. Caskey and W. J. Camp.

"High Speed Automatic Perforators, or Perforator Receivers" was the subject of a paper by W. Maver, Jr., for which he was tendered a vote of thanks.

In the absence of William Bennett, Chicago, his paper entitled "Economy in the Telegraph Department" was read by W. F. Williams and was followed by a lengthy and interesting discussion, in connection with which U. J. Fry, of Milwaukee, described the simplex train dispatcher's telephone circuit used on his road. He has five between Butte, Mont., and Seattle, Wash., a distance of 650 miles, and is equipping five circuits between Butte and Mowbridge, 720 miles, making a total of 1,376 miles. There is one repeating station between Butte and Seattle.

The last paper presented was "Telephone Economy in Railway Service" by G. K. Heyer, of New York, and which appears in this number of Telephone Engineer.

New York was chosen as the place and June 24 the time for holding the 1912 convention.

Officers were elected as follows: President, G. A. Cellar, Pittsburg; first vice-president, William Bennett, Chicago; second vice-president, A. B. Taylor, New York; secretary and treasurer, P. W. Drew.

The following new active members were elected by ballot:

H. A. Shepard, assistant superintendent telegraph, New York, New Haven & Hartford Railroad, New Haven, Conn.; H. A. Vaughan, assistant superintendent telegraph, Chicago, Burlington & Quincy, Lincoln, Neb.; G. L. Chandler, superintendent transportation, Central of Georgia, Savannah, Ga.; G. O. Perkins, superintendent telegraph, Chicago Great Western, Chicago; F. E. Camp, inspector telegraphs, Canadian Pacific Railway, Revelstoke, B. C.; E. A. Speer, inspector of construction, Canadian Pacific Railway, Toronto, Ont.; E. M. Payne, inspector of telegraph, Canadian Pacific Railway, Winnipeg, Man.; J. E. Golden, superintendent telegraph, Tidewater Pipe Line Company, Bradford, Pa.; C. W. Stockdale, general foreman, Illinois Central, Chicago, Ill.; C. W. Bradley, acting superintendent telegraph, Chesapeake & Ohio, Richmond, Va.; A. C. O'Brien, telephone inspector, Boston & Maine, Boston, Mass.

New associate members elected were:

G. K. Heyer, Western Electric Company, New York; C. T. Wilkinson, General Electric Company, Schenectady, N. Y.; D. W. Dean, special agent, American Telephone & Telegraph Company, St. Louis, Mo.; A. F. Eyerman, Bell Telephone Company, St. Louis, Mo.; W. L. Cook, sales-engineer, United States Electric Company, Chicago; J. H. Finley, Western Electric Company, Chicago; E. L. Howk, Western Electric Company, Chicago; Vernon Durbin, Holtzer-Cabot Company, Brookline, Mass.; W. O. Nevill, special agent Missouri & Kansas Telephone Company, Kansas City, Mo.; Henry Homer, special agent American Telephone & Telegraph Company, Philadelphia, Pa.; E. Whitmore, Manhattan Electric Supply Company, New York; A. D. Smith, Northern Electric Manufacturing Company, Montreal, Que.; J. F. O'Donnell, manager Western Union Telegraph Company, Joplin, Mo.; H. G. Thompson, manager Edison Storage Battery Company, Orange, N. J.; L. H. Merrill, special agent Northwest Telegraph Exchange, Minneapolis, Minn.; G. Brown, Western Electric Company, New York; E. E. Hudson, manager of sales, Edison Storage Battery Company, Orange, N. J.; A. G. Francis, railroad agent, Chicago Telephone Company, Chicago, Ill.; E. M. Fisher, commercial superintendent, Cumberland Telephone & Telegraph Company, Nashville, Tenn.; R. B. Crane, general sales agent, Rock Island Battery Company, Cincinnati, Ohio; A. D. Walters, special agent, New York Telephone Company, New York; E. V. Adams, railroad sales agent, Western Electric Company, Chicago; H. B. Fenn, special agent for Railroads, New York Telephone Company, Newark, N. J.; L. G. Martin, Okonite Company, New York, N. Y.

Listening Sets for Dispatching Circuits

One of the great advantages of the telephone for train dispatching is that it permits any official of the road to listen upon the circuit at his pleasure and to observe the grade of the service being given by the telegraph department. It has been found as a matter of fact that it

No. 18A—Testing Set.

soon becomes known to the operators that this can be done, and is done, and thereby has a very beneficial influence in improving the grade of service.

The Western Electric Company has designed and put upon the market a very neat sole leather listening outfit especially for this purpose. The set is so small that it can easily be carried in a man's pocket, and merely contains a receiver, condenser and the necessary cords and clips for attaching it to the line.

The No. 18-A test set, as this little piece of apparatus is known, is in use on a number of roads at the present time among the officials. With it they are able to connect the receiver to the line at any station where they may happen to be without interfering with the regular operator and without anyone knowing that they are upon the circuit.

It has been found by experiment that sea water is a good preservative for telephone poles. Poles that had been thoroughly soaked in sea water were found to be in a good state of preservation after several years' service.

Telephone Economy in Railway Service

By G. K. Heyer*

THERE are few if any recent developments in the railway field which in so short a time have created such a widespread interest as that of telephone train dispatching. The advances which have been made in this field are marvelous, particularly when we take into consideration the natural prejudice and opposition encountered at the outset. It is a matter of history, however, that all great advances have been made in the face of opposition from some quarter. The hardships and struggles of Morse and Bell are well known to all, and both of these men were in a certain sense indirectly responsible for the great strides which have been made in railroad development.

The telegraph coming into the railway service as it did in 1850 through the foresight of Superintendent Charles Minot of the Erie, made possible the abolition of the old time interval and flag system of advancing trains and the adoption of the present telegraph dispatching system, which it was thought for many years possessed sufficient advantages to allow the other branches of our railroads to be developed to the greatest possible efficiency.

While the advent of the telephone has shown this to be a somewhat erroneous supposition, it may be said to the credit of the telegraph that its use made possible the increased traffic capacity of the railroads, as well as beneficially influencing many other branches of railway development. In spite of the improvements obtained by the telegraph, the first engineer who received a telegraph train order refused to run on it, believing that the risk attending such action was altogether too great.

The very nature and underlying principles of the telegraph are such, however, that after railway development had reached a certain point, it was found that there was room for improvements which could not be accomplished if the telegraph method of operation were to be retained.

In the search for increased efficiency in the telegraph department, the telephone, 31 years after its invention, was turned to as offering the greatest possibilities. The one disadvantage of the telephone was that the requirements for commercial service have been such that there was little or no demand for a means of selectively calling any one station on a long and heavily loaded line. This disadvantage went the way of all others which stand in the way of progress, and there are at the present time several selective devices on the market which to a greater or lesser degree of efficiency answer the requirements.

The standard telephone equipment and practice were also found in some features to be inadequate and there have been developed special circuits and apparatus which have greatly improved the service and increased the flexibility and efficiency of the telephone system.

The maximum efficiency of the telephone system has not, however, by any means been reached, and there are under development and study at the present time many improvements, which indicate that there are no requirements for special service within the range of reason which cannot be met.

There were those, of course, who could not be convinced that any changes in the method of handling trains which had been so satisfactory for 60 years could be made without risk, and all of those interested in the subject are familiar with the arguments which were advanced against the adoption of the telephone. Notwithstanding these arguments and the fact that a great many of the present day railroad officials grew up under the influence of the Morse system, there were several superintendents of telegraph and other officials who realized from the first that with a reliable calling device there was no comparison between the results which could be obtained with the telegraph and the telephone, and it is to these men, the pioneers in telephone train dispatching, that the success since obtained is largely due. To these men certain advantages were apparent, while many others since conceded to the telephone method of operation remained to be discovered after the telephone equipment had been put in actual service.

The advantages in favor of the telephone which will be granted without hesitation by all those who have closely observed the service are that it is more flexible, quicker, safer and more reliable, and in addition makes possible better discipline and co-operation, as well as providing means for officials who are not familiar with the Morse code to exercise supervision and obtain immediate and accurate information in cases of emergency.

There has been so much said in the technical papers and in special papers prepared by recognized authorities on the subject in support of the advantages given above that it does not seem necessary at this time to dwell upon the reasons from which these advantages are deduced. Suffice it to say that the possibility of these advantages was considered by the railroad officials of such importance as to warrant the expense incident to the installation of the first telephone train dispatching equipment on some of our most important trunk line railroads. These first installations, made in the fall of 1907, were so successful that there are to-day in the United States and Canada approximately 48,000 miles of line, or nearly 20 per cent of the total railroad mileage equipped for telephone train dispatching, and the results obtained in every case sustain the judgment of the early advocates of the telephone.

Upon investigation in these days of scientific management, efficiency methods, etc., there stands out alone, far more important than any of the other advantages above mentioned, although dependent in a great measure upon them, that of economy, or the saving in dollars and cents which may be obtained by the use of the telephone.

Some of the factors which increase the traffic capacity and therefore make for economy in the telephone method of operation are:

1st. The time of calling stations, sending orders

*A paper read before the Convention of Railway Superintendents of Telegraph at Boston, June 26-30, 1911.

and receiving train reports is so greatly reduced (30 to 50 per cent) that the time gained is available for the dispatcher in better laying out his work, planning meeting points and handling the endless amount of detail which the position requires.

2nd. Dispatchers are most efficient, due to the fact that they are relieved of the mental and physical strain attending the continual operation of the Morse key, which has a most damaging effect on the nervous system and frequently results in what is known as operators' paralysis.

3rd. Through the use of the portable and siding sets train crews may get into communication with the dispatcher and receive their advance orders directly from him. This has proven a most valuable branch of the service, especially in advancing freight trains which have taken a siding some distance from a station or tower. Also, during the night, when on some roads part of the stations are closed. In this latter case the train conductors may be provided with keys and in that way have access to the dispatching telephone.

4th. The dispatch and exactness with which reports of progress on clearing up wrecks and repairing breakdowns are given to the dispatcher, thus allowing him to determine as to the handling of other trains, routing them over other roads, etc.

It has been estimated by some of the roads that if, from a wreck or any other cause, traffic is held up, the additional expense incident thereto amounts to approximately one thousand dollars per hour. On the average with the telephone system wrecks are cleared up and traffic moving again in one-half to two-thirds of the time that is possible with the telegraph. A considerable saving, therefore, can be effected in these features of railroading, and approximate yearly figures may be arrived at by knowing the cost of suspended traffic and multiplying this together with one-third or one-half of the average time of clearing wrecks and the number of wrecks per year.

This will seem impracticable to many, but it is by watching for such leaks as this and applying the necessary remedies that many of the successful commercial enterprises are made to pay substantial dividends on the capital invested. It is a well known fact that at the present time many manufacturing plants derive a large part of their profits from the by-products which a few years ago went to waste.

It may seem strange to many, particularly those who have not yet installed telephone equipment, to hear that such a saving is possible. Of course, the nature of the equipment is such that the initial cost of telephone apparatus is much higher than that of the telegraph equipment. Further, the cost of maintenance is also considerably greater with the telephone. The saving, therefore, does not show on the books of the telegraph department, and in fact, this department shows a somewhat increased running expense. This increase is, however, insignificant when compared to the reduction in the cost of handling traffic. The traffic or transportation department is then the place to look for the real excuse for the expense of providing the telephone system.

There has as yet been no general movement among the railroads using telephone equipment to keep such records as will show approximately the comparative cost of handling traffic with the telephone and the telegraph. It is believed, however, that the compilation of such information will be so convincing that those who have hesitated to authorize the expense of installing telephone equipment will see that it is costing them real money for each month's delay.

The difficulty and expense incidental to securing from the records kept at the present time information from which may be computed reliable figures of comparative expense has undoubtedly delayed the preparation of such statistics. W. F. Williams of the Seaboard Air Line has, however, prepared information which shows that for one month on 150 miles of single track on his road, and with an 11 per cent greater density of traffic for 1910 when the telephone was used, a saving of one hour and sixteen minutes in the running time of all through freights was effected over the same period for 1908 with the telegraph. From this saving of one hour and sixteen minutes for through freights, it will be seen instantly by computing the pay of the train crews, reduction of over time charges, increased efficiency of the motive power, the reduction in fuel consumption, the increased speed of hauling perishable freight, etc., that on any road the telephone is a saving proposition. In fact, these items when reduced to a monetary value showed on the Seaboard a monthly saving of $1,000 to $1,200, or a yearly saving of approximately $12,000. Comparing the cost on the telephone equipment based on $100 per mile—which includes the cost of telephone and selector apparatus, line wire (No. 9 B. & S. 208 pounds to the mile) and installation—to the yearly saving in handling through freight traffic alone, it will be seen that the telephone will pay for itself the first year. In other terms, the yearly saving amounts to in the neighborhood of $100 per mile. Carrying this still further, we may say that for the 48,000 miles equipped there should be a difference in operating expense of $4,800,000.

This may seem to some altogether too optimistic, but when considering that these figures are based on the through freight business alone and do not take into account local freight or other branches of the service, there is a little doubt but that when accurate records are kept, and all of the various items entering into the operation of the system are considered, the savings shown will be still greater.

From information received from various sources, it is evident that on all roads hauling any considerable amount of through freight the time consumed has been reduced since the installation of telephone equipment to compare very favorably with that shown on the Seaboard. For instance, on the D. L. & W., after the completion of the service between Binghamton and Buffalo, a distance of 206 miles with 46 stations, the through freights were run in approximately two hours less than was the rule when the dispatching was done by telegraph. Any number of other instances of this kind might be cited.

In the consideration of this question, no account has been taken of the possibility of combining or extending dispatching sections, directing the number of employees, providing employment for men who have received such injuries in service as to incapacitate them for the class of work previously performed, etc. Also the train dispatching circuit alone has been considered.

With the great increase in the number of telephones for commercial service and the consequent

economies effected, it is only to be expected that the use of the telephone for railway service will gradually be extended to embrace many other branches. In fact, this has already been done on some of the more progressive roads.

For handling message or other commercial and routine business between stations, the worth of the telephone has already been proven on several roads, and it is estimated that for this class of business one telephone circuit has the capacity of two telegraph circuits. On roads where the traffic is light, both the dispatching and message work can be carried on over the same pair of wires.

In connection with manual blocking, the old telegraph wires may be utilized, thus providing a grounded block circuit, or, if convenient, a metallic circuit may be employed. Either the grounded or metallic circuit is far superior to the telegraph. Blocking sets or a switching mechanism may be provided to allow one set of telephone equipment to be used on the train, message and block wires, and to cut two blocks into one for night operation.

The loud speaking receiver is admirably adapted for this service and it is thought will ultimately replace the ordinary receiver for block work.

Another use for the loud speaking receiver is in the dispatcher's office, where it may be connected directly to the train wire and relieve the dispatcher of wearing the head receiver at least a part of the time.

This instrument, in connection with a special transmitter, may also be used in terminals for announcing trains.

The yard master in the discharge of his duties will find the yard circuit of the greatest value in keeping in touch with the various departments over which he has supervision.

For moving trains out of terminals the telephone has in cases where installed proven so much quicker and more flexible that there is but little doubt that all terminal circuits will within a short time be telephone circuits.

The train order semaphore, one of the recent developments, which consists of a standard semaphore mast arranged for mounting the selector and telephone apparatus in a weatherproof compartment, can be placed at any point along the line and the telephone and selector connected directly to the train wire.

In the large freight sheds and at transfer points, in office buildings, etc., and in fact at all places where direct communication between parties not located in the same room is desired, the telephone will prove in.

Five New Telephone Circuits for C. & N. W.

The Chicago and North Western Railroad, which has been using the telephone for dispatching trains on several of its divisions for some time past, has placed an order with the Western Electric Company for telephone selectors to equip five new circuits. The number of selectors used on these circuits will be 130 and the length of circuits will be over six hundred miles.

The circuits to be equipped are one on the Fremont division, two on the East Iowa division and two on the Dakota division. The Fremont circuit will be equipped with twenty-two stations and will run between Fremont, Missouri Valley, Omaha and South Omaha. This circuit is in the form of a "Y" and the dispatcher will be located at Fremont. Traffic on this division is of the heaviest, but past experience with the telephone or other divisions of the road indicates that it will not only be able to handle the traffic, but do it more quickly and efficiently than the telegraph.

The East Iowa division is divided into two circuits, the dispatcher for each being located at Belle Plaine, Iowa. One circuit extends from Belle Plaine to South Clinton, a distance of 116 miles, and is equipped with 31 selectors; the other extends from Belle Plaine to Boone, Iowa, a distance of 87 miles, and is equipped with 23 selectors.

One of the Dakota circuits will run from Huron to Brookins, with branch lines from Athol to Oakes and from Turton to Groton, the distance covered by this main circuit and branches being 170 miles. The dispatcher will be located at Huron, and the circuit will be equipped with 36 stations.

The second Dakota circuit will run from Huron to Tracy, a distance of 163 miles. This circuit will be equipped with 20 stations and the dispatcher will be located at Huron.

Lehigh Valley Extends Dispatching Circuits

The Lehigh Valley Railroad, which a short time ago purchased a quantity of Western Electric selectors and railroad telephones to equip the east end of its Buffalo division, has just placed an order with the same company for apparatus to equip the west end of the Buffalo division.

The new circuit, which is to be 135 miles in length, extends from Manchester Yards through to Suspension Bridge, with branches from Rochester Junction to Rochester and from Rochester Junction to Hemlock, New York. Thirty-eight selectors will be installed and the dispatcher for this circuit will be located at Buffalo.

Upon the completion of the telephone circuits now under construction, traffic on the entire line from Jersey City to Buffalo and Suspension Bridge will be handled by the telephone.

Railway Appliance Association Meets

The annual meeting of the Railway Telegraph and Telephone Appliance Association was held at Hotel Brunswick, Boston, June 27. Officers were elected for the coming years as follows: Chairman, A. P. Eckert, New York; vice-chairman, J. J. Ghegan, New York; secretary-treasurer, W. E. Harkness, New York; executive committee, H. E. Merrill, New York; H. O. Rugh, Sandwich, Ill.; W. F. Crowell, New York; W. H. Graffits, Chicago; E. E. Hudson, Orange, N. J.; H. P. Kimball, New York.

A committee composed of R. A. Paterson and G. K. Heyer of New York and J. M. Lorenz, was appointed to confer with a like committee from the Association of Railway Telegraph Superintendents to make suitable arrangements for the next convention.

The Stromberg-Carlson Telephone Manufacturing Company, Rochester, N. Y., has issued its supplementary edition No. 1 of Bulletin No. 1001, concerning dispatchers' signals for electric interurban railroads. The booklet is full of valuable information for workers in the electric railway field.

Some Hints on Railway Telephony*

By W. J. Camp

INSULATORS.

DURING the period from 1887 to about 1898, the Canadian Pacific Railway Company used white porcelain insulators on a portion of the long through wires. These were of German or British manufacture. An elaborate series of tests proved their great superiority over glass from a mechanical standpoint, the average blow necessary to break a porcelain being three times that required to break the glass insulator. It was also discovered that usually a porcelain insulator was only partially destroyed when hit by a stone and that the wire was not set free and remained fastened to each pole, but the glass insulator was so badly shattered that the wire would be freed and this frequently resulted in a cross with other wires which remained attached to the pole. This advantage was offset to some extent by the fact that, on account of the porcelain insulator being white, it offered a much better mark and was the one aimed at. The price of the porcelain insulator was increased until it reached about nine cents each laid down in Montreal, and its use by us, therefore, abandoned for some years. The glass insulator with which we were supplied then depreciated in quality apparently on account of improper annealing, and appeals or complaints to the manufacturers resulted in no improvement; and, as the cost of the porcelain insulator was again very largely reduced, we have purchased nothing but white porcelain for the past three years.

Last year we procured porcelain insulators from Canada, the United States and Germany. One make turned out to have defective insulation properties, and we had a series of tests made comparing the three manufacturers and glass. All of the insulaters were of the same pattern and dimensions. One dozen insulators of each make, selected at random, were placed on pins in the open air, and frequent readings taken of insulation, humidity, temperature and barometer. During the tests the weather was of nearly every description, from dry cold to sleet, wet snow and rain. These tests proved that in every respect the German and United States insulators had from five to ten times the insulating qualities of the Canadian and glass insulators, the two former giving practically the same results with a slight difference in favor of the German and the Canadian porcelain and glass almost on a par. Tests of wires after erection show the same differences.

TRANSPORTATIONS.

The first telephone dispatching circuit we installed was transposed every half mile. The selectors were in series, alternating on each wire. The circuit was found to be slightly noisy, and we then transposed it every quarter mile, which cut down the noise for a time, but we found it almost impossible to keep the circuit free from noise while working the selectors in series; and, as we found that most of the failures were due to the contact points of the relay, we changed from series to main line bridging selector without relay. Since then the circuit has been practically free from noise, and on all subsequent circuits installed the same method has been followed. We now transpose all our dispatching circuits every quarter mile, except where two circuits parallel each for a portion of the way. Over this section one circuit is transposed every quarter mile, and the other every half mile. Looking forward to the time when the telephone will be used for other work, we arrange transpositions on our copper telegraph wires (and sometimes on the iron), every half mile for the first pair, and for the second pair, every mile, or transposed at the quarter, three-quarter, and mile, skipping the half mile.

Our method of transposing when the two wires are on the same arm, is by the use of a curved iron bracket under the arm, and so placed that the wire it carries comes directly under the wooden pin carrying the other wire over the top of the arm. Where the two wires are on separate arms we place an extra pin on the upper arm half way between two of the regular pins, and skip the pin on the lower arm. By these methods we have largely decreased the liability of crosses in case of broken insulators.

LIGHTNING PROTECTION.

The problem of adequate lightning protection is a most serious one with the Canadian Pacific Railway on the portion of the line between Lake Superior and the Rocky Mountains on account of the excessive severity of the lightning in this district. If we use sufficient arresters to take care of the heavy discharges, we most likely will kill the telephone circuit by having so many "traps for bugs." We have been using in the stations where the telephone line is looped four Argus arresters, without fuses, on the four ends of the wires, and two Argus arresters with fuses on the bridge wires to the telephones and selector.

At stations where the circuit is only legged in we have two Argus arresters with fuses. At the dispatcher's office, besides the Argus arresters we equipped the first three poles from the office with O'Connell pole arresters. In some sections this protection seems to be adequite, the circuit being worked right through storms, but in the district mentioned it does not appear to be sufficient, my reports showing that at times the telephone has to be abandoned for an hour or more on account of lightning. There have been some interruptions on account of the pole arresters, and this year we are trying out another make of office and pole arresters to the same extent as the former equipment. Some of our superintendents have asked for pole arresters at every station, but I am afraid that if such were installed they would prove to be an endless source of trouble and annoyance, and that after every severe lightning storm, the circuit would be out of commission until a lineman could be sent over it.

TELEPHONE INSPECTORS.

On the Canadian Pacific system we have one telephone inspector for 250 to 300 miles of circuit with his headquarters approximately in the center. Up to the present we have not found it necessary to provide the inspectors with motor cars, but, personally, I believe that every inspector should have a light motor car, particu-

*Paper read at the convention of the Association of Railway Telegraph Superintendents, Boston, June 26-30.

larly in sections where there are comparatively few trains. Our inspectors are supposed to be continually on the move. I consider that an inspector's duty is not so much to remove interruptions, as to prevent them occurring.

TRAIN TELEPHONE SETS.

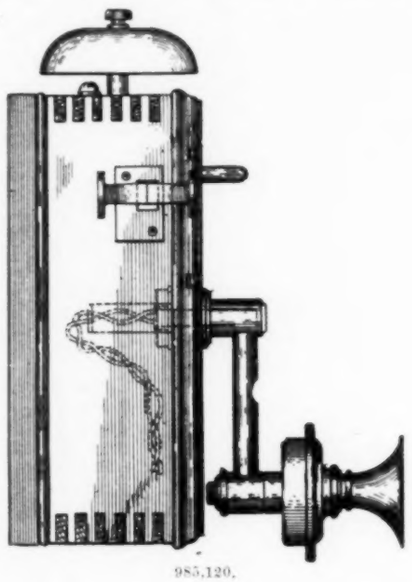
On every section where we install telephone train dispatching circuits, we equip every train with a telephone outfit, without selectors. The wrecking cars are provided with howler receivers, by means of which the dispatcher can call them in on the line if necessary. The connecting pole we used is the invention of J. F. Richardson, superintendent of telegraph of the Eastern division of the Canadian Pacific Railway. It is so arranged that connection can be made with any two wires on the line, no matter whether they are on the same arm or not. We do not install any equipment at outlying sidings as the train equipment answers every purpose should a train become stalled anywhere. On account of the severity of our climate during a portion of the year, no one could use a telephone at a pole box, and each outfit contains sufficient flexible twin wire to lead the circuit into the baggage car or conductor's caboose.

Recent Telephone Patents

By David S. Hulfish

985,024. Ringing Circuit. Engene Garretson, Buffalo, N. Y., assignor of parts to Messrs. Bierbaum, Fox, Calkins, Fuller, Morrison and Hayes. In series with the ringer of a telephone bridge is connected a resistance element having a negative heat coefficient of resistance. For the low pressure of common battery talking and signaling currents, a high resistance is maintained, but under the higher pressure of ringing currents the resistance is reduced, permitting a larger flow through the ringing for its operation. This replaces the condenser of the usual ringer bridge.

985,120. Transmitter Arm. William Aitken, Liverpool, England. The usual transmitter arm holds its transmitter mouthpiece at different heights by a hinged arm, but this one is pivoted. The transmitter swings in a circle to any desired height. A stop prevents its complete rotation.



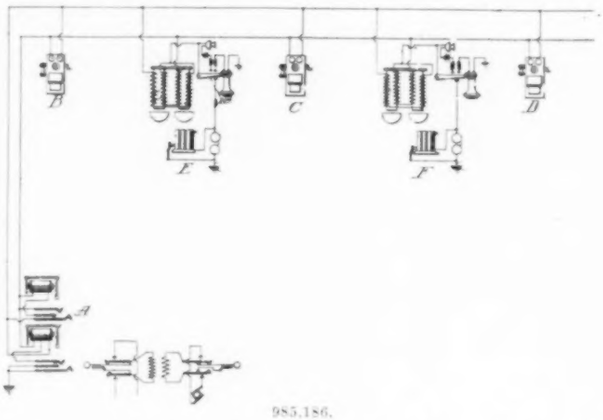
985,120.

985,169. Transmitter Cutout. Christopher M. Hartnett, Malden, Mass. A simple spring clamp is arranged upon the transmitter case to short circuit the transmitter for silencing sidetone while listening.

985,186. Phantom System. Oscar M. Leich, Genoa, Ill., assignor to Cracraft, Leich Electric Company, of same place. In a single telephone line, some of the stations work metallic and some grounder phantom. In the illustration, stations E and F are phantom-line stations and are reached by plugging into the lower jack, while stations B, C and D are metallic-line stations and reached by plugging into the upper jack A. Each jack has its signal drop, and both may be used at once, independently.

985,191. Order-Wire Key. Frank R. McBerty, New Rochelle, N. Y., assignor to Western Electric Company, Chicago. The claims cover the arrangement of springs in a strip of keys whereby economy of springs is attained.

985,524. Submarine Transmission. Delia M. Gray, Highland Park, Ill., executrix of Elisha Gray, assignor to Submarine Signal Company, Waterville, Maine. Transmitters



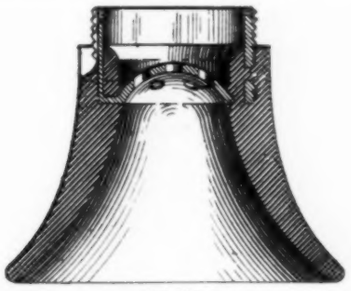
985,186.

are grouped to determine the direction from which sound is received through water.

985,616. Coin Box. David P. Meade, White Post, Va. The coin box provides circuits to be closed by the deposited coins, and the movement of the hook lever dumps the coins from their temporary resting places.

985,638. Mouthpiece. Louis Steinberger, New York, N. Y. The threads of the mouthpiece are of metal, imbedded in the cast funnel.

985,707. Insulator Bracket. Albert Scheible, Oak Park, Ill. A bracket of curved channel iron has spring clips to engage the threads of the glass insulator.



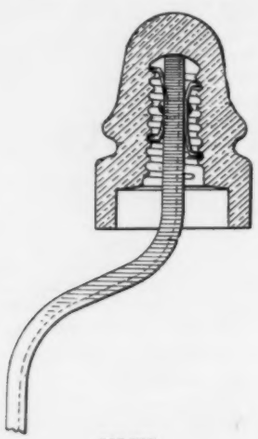
985,638.

985,820. Ringing Key. Ray H. Manson, Elyria, Ohio, assignor to Dean Electric Company, of same place. A party-line ringing key having five buttons. Each key selects a generator by contacts closed when partially depressed, and closes the generator to line when fully depressed.

985,821. Connector. Ray H. Manson, Elyria, Ohio, assignor to Dean Electric Company, of same place. A binding post for receiving a telephone tip has a spring member clamping the tip when inserted.

986,260. Lock-Out Party Line. Frank W. Adsit, St. Paul, Minn. The instrument has a stepping selector for receiving calls, the impulses for controlling being sent from a hand magneto. Each telephone has both selector and hand magneto for selecting others.

986,267. Signal Bell. Charles L. Chisholm, Marysville, New Brunswick, Canada. The mouthpiece funnel of the



985,707.

transmitter is formed into a bell gong, and the ringer armature taps upon it.

986,606. Support. Victorien Tardieu, Arles, France. A device for suspending telephones of the breast-transmitter type.

986,787. Line Relay. Alfred H. Weiss, Chicago, Ill., assignor to Kellogg Switchboard & Supply Company of same place. The line relay has three positions for its armature; partial attraction by the subscriber's telephone lights the line lamp, and full attraction by the operator's plug extinguishes the line lamp.

986,889. Intercommunicating System. Alfred K. Andriano, San Francisco, Cal., assignor to Direct Line General Telephone Company, of same place. The patented feature is the means for maintaining a busy telephone line free from interruption by other lines.

986,952. Lock. W. A. Soles, New York, N. Y. A bracket may be locked to the hook lever by a padlock in such manner that the lever cannot be raised.

987,128. Switchboard Circuits. W. A. Fricke, Chicago, Ill., assignor to Monarch Telephone Manufacturing Company, of same place. The circuits and signals are such that a lamp is displayed permanently in response to the turn of a magneto hand generator by the subscriber.

987,304. Desk Telephone. A base and standard with transmitter, a flexible shaft upon the standard and a receiver permanently mounted upon the flexible shaft.

987,338. Signal. E. E. Yaxley, Chicago, Ill., assignor to Monarch Telephone Manufacturing Company of same place. A combined drop and jack, the drop self-restoring and the helix removable.

987,637. Locking Key. F. R. McBerty, New Rochelle, N. Y., assignor to Western Electric Company, Chicago. In a key with several plungers, each plunger has an iron armature attached and the key frame has magnets arranged in a specific manner at the bottom of the frame to hold the plunger depressed.

987,864. Key. W. W. Dean, Chicago, Ill., assignor to Kellogg Switchboard & Supply Company, of same place. A party-line ringing key of four buttons. The claims refer to specific means for holding down the button last used.

988,009. Signal Transmitter. Judson McFell, Chicago, Ill. A device for transmitting telegraphic signals. A spring motor is provided and a circuit breaking cam may be adjusted to the motor shaft in position to break its circuit any desired number of times as the motor runs down.

988,044. Receiver. H. R. Stuart, Wheeling, W. Va. A device designed for very weak currents. The diaphragm has a coil on each side, and is itself polarized by coils around its edge.

988,099. Cord. Otto Hoffstrom, Chicago, Ill., assignor to Belden Manufacturing Company, of same place. The spiral of the tinsel of a flexible cord is insulated to provide a large number of conductors in the cord.

988,390. Selecting Switch. Fred Schoenwolf, Chicago, Ill., assignor to Kellogg Switchboard & Supply Company, of same place. A rotary automatic selecting switch for "Automatic-Y" service. The invention is found in means provided for preventing the switch from stopping in a position between two steps.

988,706. Receiver Shell. John Halldow, Elyria, Ohio, assignor to Dean Electric Company, of same place. The pressed metal body has a fiber lining and carries a threaded ring. The pressed metal cap also carries a threaded ring, the two threaded rings engage each other.

988,711. Test Circuit. J. D. Holmes, Pasadena, Cal., assignor to Dean Electric Company, Elyria, Ohio. To render the busy test louder to the operator, her head telephone is short circuited in series with her induction coil whenever a busy line is encountered in testing.

988,819. Transmitter. Charles R. Rogers, Waverly, N. Y. The case is conformed to carry an antiseptic pad within the case.

988,876. Transmitter. Isidor Kitsee, Philadelphia, Pa. The transmitter varies the resistance of the primary circuit by cutting in and out turns of the primary winding of the induction coil.

Foot Switches for Telephone Dispatching

On telephone train dispatching circuits, the stations are all connected to the same wires, and there may be on such a line any number of telephone sets up to 60 or 70. For conditions like this, where it is possible for any number of these stations to be listening in upon the circuit simultaneously, and where quite frequently from four to six stations are called in to receive orders, special high efficiency transmission apparatus is required.

The Western Electric Company has solved this problem by the use of a switching device. In the normal position of this switch the most efficient circuit for receiving is obtained, and when the switch is thrown the most efficient circuit for transmitting is cut into service.

No. 1A—Foot Switch.

At many stations it is considered preferable to have the operator work this switch by his foot rather than to use a key which he must throw with his hand. The advantage of the foot switch is obvious, in that it leaves both hands free for other purposes.

This foot switch consists merely of a cast-iron case in which the switch springs are mounted and from which a lever projects to operate the springs.

Another advantage of the foot switch is that it makes for greater speed in the use of the telephone apparatus. For this reason it is largely used in connection with the special types of telephone arms with which an operator does not have to put on any head set nor touch any receiver. These arms were specially designed for use in inter-locking towers, where the operator is obliged to get away from the telephone quickly to handle his levers, and these arms, in combination with the foot switching device above described, form a most efficient telephone equipment for train dispatching service.

Of Interest to the Trade

By A. L. Haase

An Interesting Pay Station

The accompanying cut illustrates a novel combination pay station which can be used either as a portable, wall or booth set, thus enabling telephone companies to carry but one style of machine in stock, ready to install for any desired purpose.

Having a switchboard and lugs for attaching the transmitter, the set is easily and economically installed and a ringer box can be located in any convenient spot near by.

As a wall set, it occupies very little space, while as a portable set it is light weight and occupies very little space on a table or show case.

This machine has the following list of attractive features:

1. With a receiver on hook slots are closed. This prevents the common mistake of depositing coins with receiver on the hook and thus avoids controversy and loss of time.

The Baird Pay Station.

2. A powerful lever.

3. Sheet steel construction. Far superior to cast iron cases.

4. Reinforced steel cash box with combination lock which gives great security.

5. Kejector. Coins deposited in wrong slot are returned to patron, thus at once rectifying mistakes and avoiding controversy.

6. Signals. One stroke on a gong for a nickel, two strokes for a dime, three strokes for a quarter and four strokes for a half-dollar. All the operator has to do is to count the loud, clear and unmistakable signal strokes.

7. One coin at a time; the signals in a Baird pay station cannot be rushed to confuse an operator. But one coin can be deposited at a time and the signals must be struck before another coin can be deposited.

There are two vital functions which a pay station must perform if it is to prove a good investment: First, collect unfailingly all the money called for by the operator. Unmistakable signals are essential to accomplish this. Second, keep safely all money that has been collected. A steel cash box will do this.

The Baird Electric Company, 3148 North Halsted street, Chicago, which manufactures this machine, will on approval to interested parties.

Book Reviews

PRACTICAL APPLIED ELECTRICITY, by David Penn Moreton, is the newest arrival in a pretty crowded field. The attempt to explain the intricacies of electrical application in simple language has produced many a volume, large and small, good and bad. Mr. Moreton's work comes a good deal nearer the mark, however, than the majority of similar efforts.

The intention of the author, who is associate professor of electrical engineering at Armour Institute of Technology, is to produce a book suitable for those who are debarred from the college course, yet want a practical working knowledge of electricity. He took as a basis for the work a series of lectures used in the evening classes of the institute, and for this reason, perhaps, the order of subjects is not the one usually followed in books of this kind. No doubt it is the better for the variance.

The book abounds in practical examples and their solutions, and analogies are used freely. The result is a clear and concise text, and a thorough consideration of every essential branch of the subject within a reasonable bulk. The work carries valuable tables and is well indexed. It can be heartily recommended.

Pocket size, flexible morocco covers, 438 pages. Price $2 net; $2.12 postpaid. The Reilly & Britton Company, Chicago, or TELEPHONE ENGINEER, Chicago.

"Peerless" Personified

"Handsome is as handsome does," and the Peerless plug set made by the Thompson Levering Company, 244 Arch street, Philadelphia, fits both ends of that phrase.

Designed for those testing engineers who do not want to go in for the more expensive switch type set, and of just as high standard of worth, this set should prove very popular.

The resistance coil blocks are arranged in numerical order so that when looking at the set with the plugs out, the total resistance measured reads just as you would read a column of figures. This is a specialty of the Peerless sets not found on other makes.

The A & B bridge arms, by reason of a commutator for reversing the position of the arms, have a range of from .001 to 1,000 times the value of the resistance unplugged in the rheostat. Any combination from 1 to 5000 ohms can be obtained on the rheostat coils, while their accuracy is guaranteed at 1/10 of one per cent.

Quick break switches are a part of the equipment to

change from the Wheatstone bridge measurements to the Murray Loop test.

Provision is also made for outside battery if a higher E. M. F. is required than is given by the regular cells which go with the set.

The batteries are the regular commercial type of battery, which is securable at any supply house, obviating the necessity of sending to the manufacturer for battery, which is a common source of complaint on some types of instrument.

The company's manager, W. J. Thompson, will be pleased to send additional information upon request. Please mention this article.

Two New Uses for the Telephone

New applications of the telephone are being made every day. A prominent Philadelphia wrecking firm employing a large number of drivers recently discarded the old method of transmitting signals from beneath the water by means of signals upon a rope and have made use of special telephone equipment manufactured by the Western Electric Company, the use of which enables the diver and the attendant upon the float to be in direct telephone communication. The use of the telephone greatly facilitates the work, especially when two or more divers are working from the same float.

Another special application of the telephone was made in the installation work of the magnificent organ now being installed in John Wanamaker's department store building in Philadelphia.

The main organ is located in the arcade on the first floor, south; a second organ, called the "echo" organ, is located on the sixth floor, north. Some idea of the magnitude of the organ may be gleaned from the fact that over 11,000 different pipes are used. The pipes are made of both wood and metal. The largest wooden pipe is thirty-two feet high, twenty-seven inches by thirty-two inches in cross section. The largest metal pipe is seventeen inches in diameter, and weighs over 800 pounds.

The air used in the playing of the organ is controlled by electromagnets, the contacts of which are closed upon the keyboards of the organ.

The main organ consists of five parts: 1. Choral. 2. Great. 3. Swell. 4. Solo. 5. Pedal.

The choral and great parts were tuned by means of a tuning fork, the other three parts were tuned in unison, using the first two parts as a basis. The actual tuning was accomplished by the use of a special telephone circuit between the basis and the part of the organ being tuned, an eight-volt series transmission circuit being used.

Upon the sixth floor, north, is a smaller organ, which is called the "echo" organ. In order to secure satisfactory results the "echo" organ must be in strict tune with the main organ. This was accomplished by the use of the telephone circuit, there being some 600 feet between the two organs. The circuit used in this case was a 24-volt straight common battery Western Electric telephone circuit.

Of course it was not possible to use the telephone in the direct tuning of some of the highest octaves, especially the piccolo notes, but the telephone was actually used to directly tune one of the middle octaves, and this was used as a base upon which the higher and lower octaves were tuned.

Illinois Committee on Public Service Commission

The legislature of Illinois has appointed a committee composed of five state senators and five state representatives to investigate the subject of public service commissions, with a view to establishing such a commission in Illinois. It will be the duty of said commission to regulate the affairs of electric light and gas companies, telephone and telegraph companies, heat, water and power utilities and possibly street railways. Owing to a political fight the legislature failed to make any appropriation for the expense of the committee, but the members promise to go ahead with the work, bearing their own expenses and trusting to the legislature to reimburse them. Senator John Dailey, Peoria, is chairman and Representative William P. Holaday, Georgetown, secretary. The committee will visit various cities to secure information on the subject of public-service commissions and will report to the next regular session of the legislature.

Automatics in England

The Post Office Exchange, Epsom, Surrey, England, will make a trial of automatic telephones. The automatic exchange, which at first will have a capacity of about 500 lines, will occupy a room below the present exchange and when the installation is complete all the subscribers will be changed over to the automatic exchange. It is thought the full automatic service at Epsom will be in use about the end of the present year, or early next year. An automatic exchange will also be installed in the general post office itself for the use of the staff and on the results of these two experiments will largely depend the future of automatic telephony in that country.

Another Way of Calling Numbers

In its effort to secure the most perfect enunciation of the numbers used in telephone calls, the Chicago Telephone Company is experimenting with a system which eliminates the word "double." Heretofore the number 2229 has been given as "Two—double 2—nine." Under the new system this number would be "Two 2—2 nine," the dash indicating a pause. The number 200 would be "Two—hundred" instead of "One double O," as heretofore. The number 4444 would be "Four four—four four." It is part of the plan to use pauses corresponding, in a measure, to the grouping of the lines in the telephone switchboard as to hundreds and thousands.

A Book About Creosoting

A booklet just issued by the Wyckoff Pipe & Creosoting Company, 50 Church street, New York, contains a vast amount of information for those interested in wood preservation. Beginning with a concentrated historical account of the art, followed by a résumé of the scientific principles of preservation, the company's peculiarly efficient process is described in detail. The Wyckoff creosoted wood conduit is an especially interesting product, and the company is prepared to prove that it will compare favorably in every way with conduit of other material. Other products described are anchor blocks, cross arms and poles, posts and timbers of all kinds, all creosoted by the Wyckoff process.

A Moisture-Proof Dry Battery

Where considerable moisture is prevalent it sometimes happens that the cardboard cartons of dry cells absorb so much moisture that when the cells are placed side by side or on a metallic base, they become short circuited. This causes them to run down and deteriorate quickly, thus necessitating frequent renewals and an attendant maintenance expense.

The Western Electric Company, realizing this, has recently placed on the market a new, moisture-proof dry battery. This cell has been designed especially for use in mine, railway and general telephone service where the batteries are subjected to moisture. The new cell has the same high efficiency, long life, high voltage and great recuperative power which characterize the standard "Blue Bell" battery. It differs from the standard cell in that the cardboard carton has been treated with a special impregnating compound which effectually prevents moisture from reaching the cell proper. This will give sufficient protection so that the life of the batteries used in damp places will be as great as that of the batteries used in any other magneto service under ordinary conditions.

Western Electric Switchboard at West Point

The Western Electric Company recently sold to the United States government a complete central battery exchange equipment to be installed at West Point, New York. This equipment consists of a multiple switchboard, with a capacity of 3,000 common battery lines, together with frames, racks, a complete power plant and 25,000 feet of paper insulated, lead covered underground cable. In addition to this the contract calls for all the necessary telephone sets, protectors, outside distributing wire and the installing and connection of the underground cable.

This switchboard, which will serve all the territory covered by the Military academy and the United States Army post, will be equipped for long distance connection. Toll lines will connect with the New York Telephone Company's office at Newberg. Telephones will be installed in the officers' quarters, stores, all the academy buildings and executive offices. It is interesting to note that men operators will be employed. The work of installing has already been started.

Washington Commission Notes

The State Public Utilities Commission of Washington is said to be planning for the consolidation of the telephone companies operating in Seattle, Tacoma and Spokane. Charles M. Fassett, commissioner of public utilities of Spokane, is quoted as saying that the matter has been mentioned to the officials of both the Bell and Home systems, but as yet no plans have been formulated. The object seems to be an actual consolidation of the two companies or a working agreement by which the subscribers of one system can connect with subscribers of the other. It is stated the Bell officials have signified a willingness to take over the Home lines, providing the commission can show them a way to do so and still make dividends for their stockholders. They state that to do so at this time would mean a raise in rates. The commission estimates that the dual system is costing the people of Seattle an unnecessary $1,000,000 every year that it continues.

Members of Wire Associations Fined

In the government case against the alleged wire trust thirty-seven of the eighty-three men indicted June 29 withdrew the plea of not guilty and accepted sentence, without trial, on pleas of nolo contendere.

Judge Archbald in the United States District court imposed fines of from $1,000 to $1,700 and costs in each case.

The action came in the face of vigorous argument against the acceptance of the plea by United States District Attorney Wise. It had never been accepted in this court, he declared, and he protested against a precedent.

The court, however, accepted the pleas and remarked:

"We now know exactly or very nearly what it means and from this time on there will be no excuse, but I feel justified in looking upon what has occurred in the past in this light and therefore I certainly regard this as calling for nothing except a proper vindication of the law by a fine."

Sentence to pay the costs and a fine of $1,000 in each case was then pronounced with the provision that where a defendant had been fined in one case the fine should be $100 for each additional case.

The nine associations, in one or more of which the indicted men are members, are:

Telephone Cable Association.
The Bare Copper Wire Association.
Weatherproof and Magnet Wire Association.
Fine Magnet Wire Association.
Horseshoe Manufacturers' Association.
Underground Power Cable Association.
Rubber Covered Wire Association.
Lead Incased Rubber Insulated Cable Association.
The Wire Rope Manufacturers.

It is alleged that the eighty-three indicted members of these associations entered into an unlawful combination and conspiracy to restrain trade.

American Electric Fuse Company

The liabilities of the American Electric Fuse Company, of Muskegon, Mich., which was declared bankrupt June 30, will, it is alleged, amount to over $700,000. Frank G. Jones, president of the company, pleaded guilty to the charge of having forged a check for $5,482.64, which purported to have been signed by R. Williamson of Chicago. On complaint of the Old National Bank of Grand Rapids, he was arrested and on July 6 was sentenced to imprisonment for an indeterminate sentence of from four to fourteen years, with a recommendation for ten years. Jones claims he did not profit by the money raised by what seems to have been a series of forgeries, but that it was used in the business of the company. Jones involved Charles L. Johnson, of Evanston, Ill., former treasurer of the company, in his confession, and on July 1 Johnson was arrested, charged with complicity in the fraudulent transactions, but was released on $7,000 bail pending trial.

Telephone Manholes Get Lighting Service

The Pioneer Telephone and Telegraph Company has carried a pair of No. 12 110-volt duplex conductors in Greenfield armored conduit through a spare duct of its conduits in the underground section of Muskogee, Okla., for operating electric soldering irons, fans and lamps in the manholes of its subterranean system. The electric service pair was installed in one of the spare lower ducts of the tile conduit at the time of pulling in the other cables and in each manhole it is led to an outlet box inclosing an Edison base socket into which any desired cord extension can be plugged. This service is used where the hole is dark or work has to be done at night. An especially useful purpose of the wires is the operation of electric fans during the warm weather, which is much appreciated by telephone employees who have tedious jobs of cable splicing and wiping to do in the hot manholes. The energy for this service is supplied from the lines of the Muskogee Central-Station Company, the wires entering the conduit through a separate meter in the telephone company's basement.

Wayside Service in California

By means of the telephone the gap between the traveling automobile and the home, the office or the garage, has been spanned, and the motorist may in the very near future talk from any point along the road in Southern California to any other point desired. This unique plan is being carried out by the Automobile Emergency Service Company, incorporated last winter in Los Angeles, and the Pacific Telephone & Telegraph Company. Stations are being installed at intervals of a few miles along the highways where connections may be made immediately by telephones carried by subscribers of the emergency service in their cars.

Both the Emergency Service Company and the telephone company have beeen conducting experiments for some time to determine the practicability of the scheme and they have become sufficiently satisfied of this fact to authorize the installation of nearly 400 stations on the telephone poles in the territory south of the Tehachapi. The plan has been tried at Detroit, Michigan, but has not been carried out along such extensive lines as planned by the two local companies. Telephone service as good as can be obtained anywhere in the West is being arranged for the subscribers of the Automobile Emergency Service Company while they remain in their cars. It is not only an important feature of the automobile emergency service, but it is to be used for business and social purposes as well.

Portable telephone sets of small and convenient size are to be carried by automobile owners in their machines. Each telephone is supplied with sufficient wire cord to reach to the connecting box on a pole and when a subscriber wants to talk all he has to do is to plug in and tell the desired number to Central.

E. H. Pendleton, vice-president of the Automobile Emergency Service Company, is in charge of the installation of the telephone service, having been engaged with Division Superintendent J. W. Gilkyson of the telephone company in working out the details of the plan. Mr. Pendleton expressed the utmost confidence in the way automobile owners will accept the plan which he claims works for their convenience and assistance.

"When automobilists are shown the practicability of this service, I am willing to gamble on at least 75 per cent of them subscribing for it," he said. "We will have telephone stations at an average of two miles apart along all the principal highways in Southern California from Santa Barbara to San Diego and from the beaches to Redlands. Superintendent Gilkyson is leaving no stones unturned to give the automobile public service equal to that in their business houses or homes and our experiments have proved to us that this can be done."

Primarily the telephone service was planned to enable the subscribers of the Emergency Service Company to call the nearest official station for help in case of accident, or when supplies are desired, but the unlimited extent to which the service could be put was soon realized and the company is arranging to supply the service to all who desire it, including doctors, messengers, delivery men, undertakers and all who have occasion to keep close connections with their places of business.

A. S. Hibbard on British Telephones

A. S. Hibbard, formerly vice-president and general manager of the Chicago Telephone Company, returned June 30 on the Mauretania from a six weeks' inspection tour of the telephone systems of Great Britain. He will assume his new duties on the personal staff of T. N. Vail, president of the American Telephone and Telegraph company, with headquarters in New York. For the present Mr. and Mrs. Hibbard will make their home at the Hotel Netherlands.

"I found that London had fewer than half the number of telephone stations New York has and a trifle over half as many as Chicago. In New York they have 310,000 stations and in Chicago 250,000. London, with a population much greater than that of the two American cities, has only 150,000 stations.

"The American system is far in advance of that in Great Britain. This applies to equipment and promptness and extensiveness of service. The average Englishman is not in a hurry for his telephone connection and therefore does not worry because he has to wait forty minutes to talk between London and Liverpool. Considering that we make connection from New York to Chicago in about five minutes or less we have 'something on' the Britisher.

"There are few telephones in residences in Great Britain. About 500,000 stations throughout the kingdom are at present controlled by the National Telephone Company and another quarter million by the government, but the government is to take over the National Company's system at the close of the year and that will probably improve the service. We have in the United States eight times as many stations for the proportionate population as they have over there."

Standard Underground Cable Company in Canada

The Standard Underground Cable Company, Pittsburg, will build a branch factory at Hamilton, Canada, at a cost of $500,000. The buildings, of which there will be six in the first set, will be of the most modern factory construction. There will be a three-story brick and structural iron building, 64 feet by 335 feet; a one-story saw-tooth building, 60 feet by 224 feet; a one-story saw-tooth building 60 feet by 250 feet; two one-story buildings, 64 feet by 90 feet, and one 30 feet by 70 feet, and an office building. The plant, when completed, will employ about 500 men.

An Indestructible Cross Arm

Megahan & Co., Westerville, Ohio, have just placed on the market the Megahan indestructible cross arm. It is made of light-colored cement and is claimed to stand a deflection of 2½ inches in a ten-foot arm without fracture or permanent set. Such an arm weighs but 75 pounds and lasts practically forever. The braces used are but 16 inches spread and three lag screws are all that is required to put them on.

Considering the long life and freedom from maintenance or repair charges of the Megahan arm, it would seem to have a great advantage over the ordinary wood arm.

New Locking Feature of the Buffalo Grip

The Western Electric Company has recently placed on the market a new "Improved Buffalo Grip," with a special feature. In Fig. 1 the new grip is shown with the jaw held open by the locking device. A turn of the handle locks the jaw in any position and enables the lineman to easily and quickly insert the wire in the grip. When the handle is pushed down, as shown in Fig. 2, the wire is held in a tight grip.

Buffalo Grip Closed and Open.

The "Improved Buffalo Grip" is made in various sizes for both bare and insulated wire, and can be supplied both with and without pulleys.

Telephones for British Royalty

Although his majesty's telephone number, "832 Westminster," can be duly rung up by any of his subjects, it does not follow that they will be able to speak to King George direct. As a matter of fact, the arrangements in the palace make it impossible for anyone to casually call up his majesty for a friendly chat. As the writer of an interesting article on the telephone at Buckingham palace, published in the *Morning Leader*, however, remarks, all the high functionaries, from Lord Knollys upward, to say nothing of minor officials and servants, are in touch with his majesty, who can speak to them in their own apartments or private residences.

Every lady and gentleman of the royal household, every functionary, can be reached in a twinkling. Then there are, of course, private lines to Marlborough house, St. James' palace and York house. Even the schoolroom of Buckingham palace is "on the wire."

There are three 50-line switchboards in Buckingham palace. Two are used for the day service and one for night purposes, and during the twenty-four hours the staff works in sections. The transfer of the lines from the day to the night service is accomplished by means of a change-over switch, either in the palace postoffice or the palace itself.

The king possesses an extension from the switchboard to his private apartments, and, in addition, his majesty has a private exchange line to his own apartments. This is used for special communications of a private nature in connection with state affairs.

Queen Mary has a private line and also an exchange line. The latter facility Princess Mary also enjoys; she can converse with her parents or with the occupants of the schoolroom. Miss Knollys has a telephone in her sitting room, from which she can converse with Queen Mary or Queen Alexandra.

Opportunity for Export Trade

American manufacturers and producers are invited to file with each American consulate a statement respecting the lines of goods they have to offer to foreign buyers.

Heretofore American manufacturers have had the privilege of filing catalogues in the consulates, but the diversity of size and form of catalogues and other printed matter thus far filed and the filing of this printed matter in English in consulates requiring other languages, has entailed unnecessary time and expense in clerical force, correspondence and translation work in the consulates. It is now proposed to obviate these disadvantages by asking each manufacturer to prepare a brief of his catalogue or printed matter according to card index specifications, these cards to be classified in card index files under proper headings, and to print same in the various commercial languages.

The importance to American commerce of this co-operative plan arranged between the Department of State and the Commercial Bureau Company for placing with each American consulate an encyclopedia of the industries of the United States, can scarcely be over-estimated. It is the perfection of system whereby the manufacturer, through the American consular service, may reach all the more important consumers of his products throughout the world.

The system permits the additions and corrections being sent at regular intervals to the consulate's files, so that they are at all times a living, growing and up-to-date directory of American industries, such as is impossible under any other plan or method. To make the work comprehensive and valuable to each it is essential that the co-operation of all manufacturers and producers interested be secured.

The Classification, compilation and distribution of the cards in cabinets is the work of the Commercial Bureau Company, which, in accordance with arrangements with the Department of State, Washington, D. C., is done without charge to the manufacturer. Full particulars will be given by the Commercial Bureau Company, 50 Church street, New York City.

Bulletin on Railway Telephony

The rapid spread of the telephone method of dispatching trains within the past few years has led to the development of an entirely new field of telephony. Apparatus to fill every requirement of this service is listed in bulletin No. 1080, "Railroad Telephone and Selective Apparatus," just issued by the Western Electric Company.

A four-page insert is devoted to the Western Electric selector, with photographs of the installations of this apparatus on three of the large trunk railroads. The selector and selector sets for local and common battery signaling are described in detail, and the ad-

vantages of the standard Western Electric telephone and selective equipment are clearly stated.

The bulletin itself contains fifty-six pages. It lists, together with full information as to types and prices a great variety of apparatus, including batteries and battery boxes, bells, buzzers, ringers and gongs, cable and cable terminals, drops, jacks and plugs, including the combined jack and signal; condensers, cords, switches, fuses, induction coils, generators, interrupters, keys, line poles, protectors and protector blocks, transmitters and receivers, transmitter arms and attachments, howlers, rectifiers, relays, repeating coils, resistance coils, retardation coils, selector sending keys, switchboard panels, telegraph sounders and relays, transformers, telephone sets of all descriptions, including hand sets, wall and desk sets, both magneto and common battery, desk stand boxes, portable and metal clad sets; blocking sets, test boards, testing cabinets and test sets.

A two-color circular sent out by the Indiana Steel and Wire Company, carrying the American flag at the top and naming the company's product as the "color bearer" to the galvanized wire industry, is one of the interesting specimens of advertising literature received this month.

Waage Irons Use Nickel-Chromium Units

In our last issue we stated that the Waage Electric Company used copper wound resistance units. This was an error, as the company only uses nickel-chromium wound units, which have been proven by actual service tests to be superior to anything else in use.

The company has just issued Bulletin No. 2, which has some interesting information regarding soldering irons. Write for it.

The Butler Electric Company, David City, Nebr., is mailing out an interesting little booklet, which gives specific information regarding the Butler ringing machine. The various types of machine are described in detail, and suggestions as to which type of machine is applicable to the various towns are listed in a manner that should bring the company considerable new business.

The General Electric Company recently issued bulletin No. 4787, which is devoted to the subject of wires and cables. The publication should be of considerable service to purchasing agents, central station managers, and all having occasion to buy or use wire and cable for any service. The book contains much data but no prices.

Brevities of the Business

PERSONAL NOTES.

F. L. McNally, for many years district commercial superintendent of the Pacific Telephone and Telegraph company at San Francisco, has been placed in charge of the northern division, with headquarters at Seattle. He will be succeeded by Thomas F. Delury, now district commercial superintendent at Oakland. H. S. Brownlee, at present commercial manager at Oakland, will succeed Mr. Delury and will himself be succeeded by Maynard Bailey, now commercial manager at Berkeley, and the Berkeley vacancy will be filled by B. A. Glover, now district contract agent at Oakland. All these transfers are in the nature of promotions.

C. E. Stratton, district manager of the Colorado Telephone company at Colorado Springs, has become general manager of the Tri-State Telephone company, El Paso, Tex.

Paul A. Holland, manager of the Colorado Telephone company at Trinidad, has been appointed district manager of the company at Trinidad.

L. F. Duggan, for several years district manager for the Bell Telephone Company, Arkansas City, Kans., has been promoted to the position of district commercial superintendent with that company.

C. A. Bunton has been appointed wire chief of the Colorado Telephone company at Colorado Springs, to succeed O. F. Teschner, who has taken a position with the Tri-State Telephone company, El Paso, Tex. Mr. Bunton is a telephone man of long experience and thoroughly experienced in all phases of the work.

W. A. Connelly, for the past eight years assistant wire chief of the Colorado Telephone company, Colorado Springs, has been promoted to the position of district manager of the company at Cripple Creek, to succeed Ray Morris, who goes to Pueblo.

A. S. Hibbard, formerly vice-president and general manager of the Chicago Telephone company, but now on the personal staff of T. N. Vail, president of the American Telephone and Telegraph company, with headquarters at New York, recently made a six weeks' inspection tour of the telephone systems of Great Britain.

M. H. Driftmier has been appointed manager of the Independent Mutual Telephone company, Shenandoah, Iowa, succeeding M. I. Robinson, who was compelled to resign on account of his health.

E. L. Hart, general manager of the Hanamo Telephone company, has become general agent of the Home Telephone company of St. Joseph, Mo., with headquarters at 306 North Tenth street, that city.

Edward Everett has been appointed manager of the Newton Telephone Exchange, Newton, Kans., to succeed A. R. Champlin, resigned.

J. W. Thompson, formerly superintendent of traffic of the Bell Telephone company, St. Louis, Mo., who was compelled to resign about a year ago on account of ill health, has been re-appointed to his former position by General Manager F. R. Mott.

Charles Bobe has been appointed general manager of the Home Telephone company at Weatherford, Texas.

George A. Roberts, Temple, Texas, has been appointed district traffic chief for the Southwestern Telegraph and Telephone company at Cleburne.

Walter W. Hiller, assistant treasurer of the Wisconsin Telephone company, has been appointed supervisor of collections in the new combination of Bell telephone systems in the middle west, his territory embracing Wisconsin, Ohio, Illinois, Indiana and Michigan. His headquarters will be at the central offices of the affiliated companies in Chicago. Mr. Hiller had been in the service of the company for twelve years. The members of his department presented him with a silver loving cup bearing his name, the date of his entering the service of the company and dates of successive promotions since that time.

R. A. Walker, formerly manager for the Central Iowa Telephone company, with headquarters at Iowa Falls, has been made general manager of eight telephone systems connected with the Iowa Telephone company at the following points: Ackley, Valley Junction, Bloomfield, Colfax, Dallas Center, Mitchellville, and Corydon. He will maintain offices at Des Moines.

Wesley R. Ellis has been appointed manager of the People's Telephone company, Ashtabula, O.

W. T. Friganza, formerly manager of the Interior Telephone company, Vienna, Ill., has been placed in charge of the Central Union Telephone company's exchange at Cairo, Ill.

J. C. Buckley, telegraph and telephone inspector for the government of New Zealand, has been making a tour of inspection of the various telephone systems of the United States.

J. F. Rossman has been appointed manager of the Bell Telephone company at Canton, Ill. He was formerly in charge of the company's exchange at Chenoa, where he will be succeeded by Oren Orendorff.

Orrin F. French, for the past five years employed as mechanical engineer with the New York Telephone company at Buffalo, recently died in that city while undergoing an operation for appendicitis. He was recognized as an engineer of marked ability and had earned an enviable position in the telephone field.

Shortly after his graduation from Case he became interested in the Cuyahoga Telephone company and after two years was made mechanical engineer of the company. In that capacity he was brought into close relation with the various telephone concerns, at that time owned in Cleveland, and soon became one of the strong men of the independent forces. He leaves a wife and two children.

NEW TELEPHONE COMPANIES.

GREENWOOD, ARK.—Articles of incorporation have been filed for the Citizens' Telephone company of Spring Hill, with a capital stock of $10,000. The officers are as follows: President, Cliff Rogers; vice-president, W. A. Maxwell; secretary, C. C. Hayes; treasurer, Fred Weindle; manager, Andy Gehebe. The company's headquarters are at Barling.

SAN FRANCISCO, CAL.—The Perpetual Germ Proof Telephone Mouthpiece company has been incorporated with a capital stock of $75,000. The directors are E. J. Leiter, F. Rittigstein, J. L. Jannet, M. F. Rapp and W. M. English.

DUBLIN, GA.—The Stephens-Carey Telephone company has been incorporated with a capital stock of $12,000 to operate lines in Lauress and adjoining counties. The incorporators are: W. F. Colley, J. A. Fausset and H. J. Abney.

WATKINSVILLE, GA.—Details looking to the organization of a telephone company at this place have been completed by W. T. Bright, of Maxeys, and J. Warren Smith and E. P. Johnston of this city.

CAREY, IDAHO.—The Carey Telephone company has been incorporated by E. W. Fox, J. R. Adamson, T. B. Evans, C. C. Shelter and T. C. Stanford.

LE ROY, ILL.—The Le Roy Telephone company has been incorporated with a capital stock of $15,000. The incorporators are: B. F. Baker, Celia E. Baker and Jay Keenan.

ROCKFORD, ILL.—The Northwestern Telephone and Telegraph company has been incorporated with a capital stock of $30,000. The incorporators are: George B. Callsher, James H. Rush and George J. King.

PETERSBURG, ILL.—The People's Telephone company of Menard county has been incorporated with a capital stock of $100,000 by Henry H. Colby, D. W. Freckelton and A. J. Parsons.

LA PAZ, IND.—Articles of incorporations have been filed for the Home Telephone company, La Paz and Lakeville, with a capital stock of $10,000. The incorporators are: J. W. Hildebrand, William Hildebrand and others.

BAKER'S CORNER, IND.—The Baker's Corner Horton Telephone company has been incorporated with a capital stock of $4,000 to establish and maintain telephone exchanges. The incorporators are: C. B. Jones, F. M. Foulke and E. Hodson.

LEWIS, IA.—The Lewis Mutual Telephone company has been incorporated by J. M. Meredith and F. H. Franklin with a capital stock of $1,500.

GASTON, KY.—The Farmers' Mutual Telephone company has been organized with the following officers: President, W. B. Fallaw; vice-president, J. H. Price; secretary, D. M. Craft; treasurer, W. D. Pound. It is the intention of the company to construct a line from Gaston to Swansea and other points.

GREENVILLE, ME.—The Northern Maine Telephone and Telegraph company has been incorporated with a capital stock of $10,000. The officers of the company are as follows: President, Harry L. Sawyer; treasurer, Percy G. Barrows.

MINDEN CITY, MICH.—The Minden City Telephone company has been incorporated with a capital stock of $3,000.

BERRIEN SPRINGS, MICH.—The Berrien Springs Telephone company has been incorporated with a capital stock of $10,000.

COOK, MINN.—The Pioneer Telephone company was recently organized at this place and its officers are as follows: President, Henry Knutson; vice-president, H. B. Ellsworth; secretary, I. T. Halseth; treasurer, John Gilbertson.

COOK, MINN.—The Farmers' Co-operative Telephone company is the name of another company just organized. Theodore Burtness is president of the company and Andrew Tonham, secretary.

ATHENS, MO.—Articles of incorporation have been filed for the Athens Telephone company with a capital stock of $25,000. The incorporators are: J. A. Jones, John Murchison, E. A. Carroll, S. M. Cain and E. Henderson.

RANDOLPH, NEBR.—The Northwest Farm Line has been incorporated with a capital stock of $1,000 by J. W. Stuckal and others.

ATLANTIC CITY, N. J.—The Atlantic County Telephone company has been incorporated by Charles W. Gaskell and George W. Stone of this city and Frederick A. Demarest of Philadelphia, with a capital stock of $50,000. The company will build a new plant and lay its lines along the Shore Road between Somers Point and Absecon. The wires will be laid in underground conduits. The work of construction will begin in the near future.

HAMMONTON, N. J.—Kuemmerle and Company is the name of a new corporation formed for the purpose of operating gas and water works, telephone lines, etc. The capital stock is $100,000 and the incorporators are: W. Kuemmerle, Jr., A. M. Worstall, Philadelphia, and S. H. Roseberg, Hammonton.

CUERVO, N. M.—Articles of incorporation have been filed in the territorial secretary's office by the Cuervo Telephone company. The capital stock is $5,000, and the incorporators are: John H. Easley, A. Keeter, George N. Perkins, W. T. Gragg, W. B. Terry and S. P. Morrison.

NEW YORK, N. Y.—The New York Magnaphone and Music company has been incorporated with a capital stock of $1,000,000 to maintain a system of electric telephones for the general telephone business and the distribution of music. The incorporators are: G. R. Webb, C. A. Benton, J. L. Blackwell, New York City.

GREENWOOD, N. Y.—The Jasper and Greenwood Independent Telephone company has been organized with the following officers: President, Seymour W. Dennis; vice-president, A. L. Lewis, Jr.; secretary and treasurer, E. M. Scribner; directors, F. L. Warriner, Fred McMindes and W. O. W. Slocum.

ROLLA, N. D.—The Rolla Rural Telephone company has been incorporated by A. C. Graham, Arthur Dixon and Robert Fraser of Rolla, with a capital stock of $10,000.

ALVA, OKLA.—The North Eaglechief Valley Telephone company has been incorporated with a capital stock of $920. The incorporators are: John F. Parsons, Thos. J. Benton and John C. Raymer.

PRAIRIE CITY, OREG.—Articles of incorporation have been filed for the Blue Mountain Mutual Telephone company.

ASTORIA, OREG.—Articles of incorporation of the Nehalem Valley company with a capital stock of $2,500. The incorporators are: James Jamison, J. C. Pope and David Tweddle. It is the purpose of the company to construct and operate a telephone line between Astoria and Elsie.

HERMISTON, OREG.—The Hermiston Farmers' Exchange Telephone company has been incorporated with a capital stock of $10,000 by W. H. Skinner, Geo. H. Cressy and others.

DOYLESTOWN, PA.—A charter has been granted the Bedminister Telephone company. William S. Nicholas is president of the company.

DELTA, PA.—Fred N. Ramsey, E. W. Keyser, and Jacob E. Weaver have made application for a charter for the Delta Telephone company.

WHITE POND, S. C.—The White Pond Telephone company has been incorporated by O. N. Curtnev. W. B. Owens, O. L. Weeks and J. W. Black with a capital stock of $2,000.

STATON, TEX.—The Staton Telephone company has been incorporated by W. D. Yelverton, J. L. Sherman and S. G. Von Alleman, with a capital stock of $2,000.

HUMBLE, TEX.—The Home Telephone company has been incorporated with a capital stock of $3,500.

EMERY, TEX.—The Rains County Rural Telephone company has been incorporated with a capital stock of $2,000 by B. F. Pippin, J. A. Amis and B. A. Carter.

PALACIOS, TEX.—The Coast Telephone company has been incorporated with a capital stock of $35,000. The incorporators are: T. J. Hardey, T. J. Poole and H. W. Dean.

OAKESDALE, WASH.—The Oakesdale Telephone company has been incorporated with a capital stock of $10,000 by C. H. Mead and A. G. Woodward.

CENTRALIA, WASH.—The Hanaford Skookum Telephone company has been incorporated by A. N. Bannse and W. L. Esham with a capital stock of $1,500.

LA CROSSE, WIS.—Articles of incorporation have been filed for the Holmen Telephone company. The capital stock is $25,000 and the incorporators are B. Keppel, A. O. Casberg, Julius Berg, W. D. Sandiman, J. M. Halderson and C. B. Sletteland.

CLOVER, WIS.—The Clover Telephone company has been incorporated with a capital stock of $3,000 by Peter Soronen, Jr., Otto E. Kaupp and Herman Luoma.

LA VALLE, WIS.—The La Valle Telephone company has been incorporated with a capital stock of $15,000 by S. A. Towne, Edmund Tordorff and Elmer Gardner.

RED GRANITE, WIS.—Articles of incorporation have been filed for the Red Granite Telephone company with a capital stock of $4,000. The incorporators are: Louis Lueck, F. W. Carley and William Bannermann.

WAYNESBORO, PA.—The Tomstown Rural Bell Telephone Company has been organized with the following officers: Presi-

dent, J. W. Newcomer; secretary, A. S. Snowberger; treasurer, C. O. Bonner.

Scottdale, Pa.—A private telephone company has been organized with the following officers: President, John B. Truxell; vice-president, William Hay, secretary, Ernest Overholt; treasurer, Albert Truxell.

Fort Loudon, Pa.—The Fort Loudon and Cove Gap Telephone Company has been incorporated by Chris. L. Gish, John A. Ruder, C. D. Smith, S .M. Ryder and John S. Rotz with a capital stock of $5,000.

Weatherly, Pa.—Articles of incorporation have been filed for the Packer Township Telephone Company with a capital stock of $5,000, by W. F. Miller, J. J. Gerhart, W. H. Reed, Joseph F. Horn.

Gray Court, S. C.—F. D. Ball, J. N. Leah and others have organized the Gray Court Telephone Company with a capital stock of $1,500.

Lamar, S. C.—The Lamar Telephone Company has been incorporated with a capital stock of $1,000. S. J. Jeffords is president of the company.

Gaston, S. C.—The Farmers' Mutual Telephone Company has been organized at the place with the following officers: President, W. B. Fallaw; vice-president, J. H. Price; secretary, D. M. Craft; treasurer, W. D. Pound. It is the intention of the company to construct a line to Sansea and other points.

Portland, Tenn.—The secretary of state has granted a charter to the Portland Mutual Telephone Company. The capital stock is $1,000 and the incorporators are J. K. P. McGlathlin; C. W. Kerley, S. H. Roark, J. E. McNeill and Jew Bailey.

Nashville, Tenn.—The secretary of state has also issued charters to the Seminan Telephone Company of Weakly county, and the Brockin Town Mutual Home Telephone Company, Sumner county.

Kenton, Tenn.—The Mason Hall Telephone Company has been incorporated with a capital stock of $10,000. The incorporators are T. P. Finch, president; J. B. Skinner, W. J. Hopper, A. T. Thompson and Murray Dozier.

Alpine, Texas—J. E. Mills, W. F. McGaughey and others have incorporated the Alpine Telephone Company with a capital stock of $15,000.

Barry, Texas—The Vest Telephone Company has been incorporated by D. W. Vest, J. W. Denton, A. H. Elmore and others with a capital stock of $20,000.

Buda, Texas—The Buda Telephone Company has been incorporated with a capital stock of $5,000 for the purpose of purchasing the local telephone exchange. The directors of the company are: W. S. Birdwell, president; L. L. Carter, vice-president; C. C. Huddleston, secretary-treasurer; J. J. Blanton and J. W. Adair. The new company proposes to make a number of improvements.

Denmark, Wis.—The Denmark Farmers' and Merchants' Telephone Company has been incorporated with a capital stock of $5,000 by P. C. Fredrickson, Ole Hanson and John F. Eng.

Freistadt, Wis.—P. W. Kramer and others have incorporated the Ogaukee-Washington Telephone Company with a capital stock of $50,000.

Ogdensburg, Wis.—The Ogdensburg Telephone Company has been incorporated by W. G. Lytle, J. C. Johnson and A. E. Freagen with a capital stock of $4,000.

Sheridan, Wyo.—The Bannner and Murphy Gulch Mutual Telephone Company has been incorporated for the purpose of constructing telephone lines and dealing in telephone instruments. Zackariah Burris is president of the company and J. F. Kirkpatrick, secretary.

Westfield, N. C.—The Big Creek Telephone Company has been chartered with a capital stock of $10,000 by J. C. Frans and others.

Silver Creek, Nebr.—The Silver Creek Telephone Company has been incorporated with a capital stock of $5,000.

Garfield, Ohio—The Hardinsburg and Garfield Telephone Company has been incorporated by John J. Pate, Richard Black, Frank Woods, William Snyder, James Caber and C. F. Black; capital stock $440.

Claypool, Ohio—Articles of incorporation have been filed for the Claypool Telephone Company with a capital stock of $1,800. The incorporators are John A. Willoughby, J. M. Adair and Robert Mottley.

Articles of incorporation have been filed for the Sandy Valley Telephone Company with a capital stock of $10,000. The incorporators are W. E. Johnson, B. M. Deskins and John W. Kerr.

Greenville, Ohio—The Pleasant Hill Farmers' Telephone Company has been incorporated with a capital stock of $240 by M. W. Carver, J. M. Gorley, William Fox and E. W. Jenkins.

Oklahoma City, Okla.—The Oklahoma Home Telephone Company has been incorporated with a capital stock of $5,000 by C. E. Bishop, W. L. Maupin and R. S. Ross.

Brushyhead, Okla.—The Farmers' Rural Telephone Company has been incorporated with a capital stock of $2,250, and the directors are W. J. Strang, W. A. Howard and J. A. Johnston, with postoffice at Chelsea.

Haskew, Okla.—The West Union Mutual Telephone Company has been incorporated with a capital stock of $3,500. The incorporators are A. W. McNutt, J. E. Roper, Robert Litton, George H. Kelly and others.

Row, Okla.—Articles of incorporation have been filed for the Beck Prairie Telephone Company; capital stock $200. The incorporators are Chas. Howerton, John S. Beck, Frank Potter, Joe Beck, W. D. Beck, D. Howerton, James Murphy, W. A. Murphy, Harlin Beck and Guy Beck.

Savanna, Okla.—Articles of incorporation have been filed for the Savanna Celectine Telephone and Telegraph Company with a capital stock of $5,000. The incorporators are L. L. Georgia, Frank Savage, W. J. Shepard, P. W. Fennell and J. W. Jennings.

Eugene, Ore.—The Independent Farmers' Telephone Company is the name of a new organization incorporated with a capital stock of $48,000 for the purpose of installing a station for free switching for the hundreds of farmers' lines radiating in all directions from this city. All the lines are owned by farmers and the reason for this action is the alleged exorbitant charges for switching by the Pacific Telephone and Telegraph Company. The work of installing a switchboard will soon begin.

Vale, Ore.—The Maltheur Independent Telephone Company has been incorporated by J. A. Kennedy, H. S. Johnson and Harry Abram, with a capital stock of $15,000. The company aims to obtain control of all the lines in the county and is planning to extend its lines in all directions. The principal office of the company is Vale.

Bakersfield, Calif.—The Lost Hills Telegraph and Telephone Company has been incorporated by Richard Hastings, J. L. Evans and F. G. French with a capital stock of $25,000.

Denver, Colo.—The Tri-State Telephone Company has been incorporated with a capital stock of $1,000,000 by E. B. Field, E. B. Field, Jr., and J. E. McDonald.

Pueblo, Colo.—Articles of incorporation have been filed for the Pueblo Southwestern Telegraph and Telephone Company with a capital stock of $50,000. The incorporators are W. D. Garwood, B. H. Tallmadge and John H. Voorhees of Pueblo.

Macon, Ga.—Application has been made for a charter for the Dry Branch Telephone Company, which has for its purpose the establishment of an independent telephone system throughout Twiggs County.

Ilo, Idaho—The Salmon River Co-operative Telephone Company has been organized with the following officers: President and manager, Bert Tefft; secretary, Thomas Stevens; treasurer, W. A. Miller.

Odin, Ill.—The Odin Telephone Exchange has been incorporated with a capital stock of $15,000 by James N. Dace, Horace N. Woodward, Charles E. Sloan, Lafayette Somerville and W. H. Farthing.

Hudson, Ill.—Articles of incorporation have been filed for the Hudson Telephone Company by W. P. May, Maro B. Farwell and Floyd May; capital stock, $2,000.

Evansville, Ind.—Articles of incorporation have been filed with the secretary of state for the Evansville Independent Telephone Company. The company is capitalized at $25,000 and its purpose is to operate in Vanderburg, Posey, Gibson, Pike, Dubois, Perry, Spencer and Warrick counties. The incorporators are E. B. Oslage, E. G. Lockyear, H. T. Cooper, M. H. Gatch and P. J. Fischer.

Glendale, Iowa—The Glendale Telephone Company has been incorporated with a capital stock of $2,500. John S. Wilson is secretary of the company.

Lake Mills, Iowa—Articles of incorporation have been filed for the Center Telephone Company with a capital stock of $5,000. The incorporators are M. T. Peterson, R. J. Jensen, A. A. Fruiten, P. L. Dahlen and T. N. Truile.

Cleghorn, Iowa—The Epworth Telephone Company has been incorporated by E. H. Mitchell, W. J. Bryant and Lee Walters.

Memphis, Mich.—The St. Clair Central Telephone Company is the name of a new organization capitalized at $15,000 which has been formed to take over the exchanges at Memphis, Emmett, Goodells and Lambs and the rural lines extending out from these.

Many improvements will be made by the new company, it being the intention to expend from $8,000 to $10,000 in extensions and improvements. The officers of the company are as follows: President, C. C. Peck; vice-president, Henry F. Marx; vice-president and president, respectively, of the German-American Savings Bank, Port Huron; secretary and treasurer, C. L. Boynton; general manager, C. C. Failing, manager of the Thumb district of the Michigan State Telephone Company.

PIKEVILLE, KY.—The Sandy Valley Telephone Company has been incorporated by W. E. Johnson, R. M. Deskins and John W. Kerr; capital stock, $10,000.

BAGLEY, MINN.—The Clover Telephone Company has been incorporated by C. R. Bailey, Oscar Barness and M. J. Kolb with a capital stock of $25,000.

STEPHEN, MINN.—Articles of incorporation have been filed for the Stephen Farmers' Independent Telephone Company; capital stock, $3,000. The officers of the company are: President, D. A. Green; secretary, J. R. Mack.

HENNING, MINN.—The Henning-Vining Telephone Company has been incorporated by A. B. Trana, M. B. Lund, John Guisness and others, with a capital stock of $4,000.

SPRING GROVE, MINN.—The Spring Grove Telephone Company was recently incorporated with a capital stock of $2,500. The incorporators are J. C. Gran, Ove Heogh, C. J. Schansberg.

CUBA, MO.—The Cuba and Oak Hill Telephone Company has been incorporated with a capital stock of $2,000 by P. S. Wood, J. J. Toner, A. J. Shipley and others.

EUREKA, MONT.—The Tobacco Telephone Company has been organized with the following officers: President, P. N. Benard; secretary, J. W. McCalder; treasurer, L. J. R. Chapman.

BEVERLY, NEBR.—The Frenchman Valley Telephone Company has been incorporated with a capital stock of $1,000.

INAVALE, NEBR.—The Farmers' Creek Telephone Company has been incorporated with a capital stock of $9,600. The incorporators are W. H. Moore, Ole Olson and E. H. Gilbert.

MT. HARMON, N. J.—Articles of incorporation have been filed for the Patrons' Telephone Company. The capital stock is $10,000, and the incorporators are James I. Cook, Samuel Reed and John G. Anderson.

BERRIEN SPRINGS, MICH.—Articles of incorporation have been filed with the secretary of state for the Berrien Springs Home Telephone Company with a capital stock of $10,000. The officers of the company are as follows: President, George A. Briggs; vice-president, Charles E. Garmon; secretary and treasurer, George W. Brown. The new company will take over the entire plant and franchise now owned by Fox and Garmon. It is the intention to extend the service over the surrounding territory.

KELLOGG, MINN.—The Greenfield Farmers' Telephone Company has been organized with headquarters at this place. The capital stock is $10,000.

KALISPELL, MONT.—Plans are under way for the incorporation of the Columbia Falls and Grand View Telephone Company with a capital stock of $10,000.

EMERY, TEX.—The Rains County Telephone Company has been incorporated with a capital stock of $25,000 by B. F. Pippin, J. A. Amis, B. A. Carter and M. J. Arrington.

OAKESDALE, WASH.—The Oakesdale Home Telephone Company has been organized by A. G. Woodward, Ed Roberts and J. W. Martin with a capital stock of $10,000.

MARION, N. C.—A charter has been granted the Marion Telephone Company; capital stock, $10,000. The incorporators are N. D. Blanson, J. D. Blanson and W. Arthur McCall.

WESTFIELD, N. C.—The Big Creek Telephone Company has been incorporated by J. C. Frans, R. L. Nunn, J. H. Wright and others, with a capital stock of $10,000.

PATTERSON, N. C.—The Lenoir-Blowing Rock Telephone Company has been incorporated with a capital stock of $20,000 by S. F. Harper, Joseph Harper and others.

PLAZA, N. D.—Articles of incorporation have been filed for the Plaza Telephone Company by James E. Norton, Ole Bangen, William Power, Herbert Frink and William Ableson, all of Plaza. The capital stock is $50,000.

RHAME, N. D.—The Rhame Light, 'Phone and Water Company has been incorporated with a capital stock of $4,000 by Hiram H. Bay, Simon Brown, W. B. Shaw, J. Guy Sharp and Ole Paulson, all of Rhame.

BRENNA, N. D.—The Grand Forks and Brenna Rural Telephone Company has been incorporated with a capital stock of $5,000. The incorporators are Orjans H. Brenna, Charles Bateman and John Jamieson.

NEWPORT, OKLA.—The Lone Grove and Woodford Telephone Company has been incorporated with a capital stock of $1,500.

SOMERSET, OHIO—The Pitman Creek Telephone Company has been incorporated by John Colyer, Jr., G. W. Richardson and J. T. Murphy.

FRANKLIN, OHIO—The Farmers' Mutual Telephone Company has been incorporated with a capital stock of $2,000 by C. N. Baird, Oswald Kummer and V. D. Hammond.

LOWERY, OKLA.—The Lowery Mutual Telephone Company has been incorporated by John H. Collins, W. B. Foreman and L. A. Moore; capital stock, $500.

COUNCIL HILL, OKLA.—Articles of incorporation have been filed for the Farmers' Telephone Company of Council Hill. The capital stock is $3,000, and the directors of the company are R. L. McCoy, J. F. Sanders and W. H. Standley.

NORMAN, R. F. D. 5, OKLA.—The Enterprise Telephone Company of Cleveland County has been incorporated with the following directors: T. M. Fishburn, J. A. Mendenhall and R. A. Robertson, all of Norman, R. F. D. No. 5.

PERRY, OKLA.—The "Four D" Company has been incorporated at Perry by August Kahres, Joe Jarousek, George Lumber and Peter Gordon, all of Perry.

MCMINNVILLE, ORE.—The McMinnville Telephone Association was recently incorporated with a capital stock of $1,000.

BENTLEYVILLE, PA.—A charter has been granted the Bentleyville Telephone Company. The capital stock is $5,000, and the incorporators are A. N. Booth, W. F. Richardson, J. M. Parden, Joseph H. Frederick, J. B. Richardson, C. K. Frye, J. W. Piersol, John Burkhart, T. S. Iams, P. B. Dever, William Greenville, O. T. Finley, Joseph M. Nichols, U. G. Ames and T. A. Hetherington of Bentleyville; Leo Fetzler and E. E. French of Ellsworth, and F. P. Watson, Scenery Hill.

WAUBAY, S. D.—The Alto Farmers' Telephone Company has been incorporated with a capital stock of $24,875. The incorporators are John Kranhold, Truman Mallery, W. H. Mallery and T. E. Mickelson.

MANCHESTER, TENN.—The Farmers' Union Telephone Company has been incorporated by T. G. Powell, A. M. Saunders and G. H. Banks with a capital stock of $5,000.

STRAHL, TENN.—The Tennessee River Telephone Company has been incorporated by C. M. Smith, R. D. Kellar, J. R. Roark and J. R. Sanders, with a capital stock of $5,000.

LEBANON, TENN.—The Lebanon Home Telephone Company has been incorporated with a capital stock of $15,000 for the purpose of installing a local system. The officers are as follows: President and general manager, C. F. Mikels; vice-president, J. T. McClain; treasurer, J. J. Askew; secretary, H. H. Thomas.

HENRY, TENN.—The Henry Telephone Company has been incorporated by H. C. Burnett, G. G. Baker, J. T. Allen, J. W. Roseberry and T. H. Bowden. The company will own and operate a telephone system in Henry and vicinity.

ATHENS, TEX.—The Athens Telephone Company has been incorporated with a capital stock of $25,000. The incorporators are J. A. Jones, J. W. Murchison, E. A. Carroll, S. M. Cain and E. Henderson.

HUMBLE, TEX.—The Home Telephone Company has been incorporated with a capital stock of $3,500. The incorporators are F. N. Burton, E. W. Corley and Matt McEntee.

STATON, TEX.—The Staton Telephone Company has been incorporated by W. D. Yelverton, J. L. Sherman and S. G. Von Allemen; capital stock, $2,000.

CHELAN, WASH.—The Knapp's Coulee Telephone Company has been organized with George W. Wilson, president, and M. A. Almandinger, secretary.

HUNTINGTON, W. VA.—The Harry S. Stout Company has been incorporated with a capital stock of $10,000 to deal in telephone and telegraph poles. The incorporators are Harry S. Stout, Charleston; B. S. Whittemore, Union, N. Y.; W. M. Mercereau, Staunton, Va.; E. B. Mercer and J. M. Hawkins, Huntington.

FAIRMONT, W. VA.—The East Side Telephone Company has been incorporated with a capital stock of $10,000 for the purpose of constructing telephone lines in Marion and Monongahela counties. The incorporators are A. A. Hamilton, D. S. Hoffman, George M. Nuzum, Paul Hamilton, Aza Nuzum and James Zinn, all of Fairmont.

WALWORTH, WIS.—The Walworth Telephone Company has been incorporated with a capital stock of $25,000. The incorporators are E. A. Walters, C. M. Maxon and F. E. Lawon.

TYLER, TEX.—The Gulf States Telephone Company, recently incorporated with a capital stock of $250,000, has completed the purchase of the property of the Southern Telephone and Telegraph Company in this state. The officers of the new company are as follows: President, S. A. Lindsey; vice-president, H. B. Marsh; secretary, F. H. Merrill, Jr.; treasurer, A. L. McMurray.

FINANCIAL ITEMS.

FORDYCE, ARK.—At the regular meeting of the stockholders of the Southern Telephone company the capital stock of the company was increased to $300,000 and a bond issue of that amount was authorized. The successful management of the company, through its officers, A. B. Banks, president, and H. C. Couch, general manager, has caused its stock to be greatly in demand and the new issue is already heavily oversubscribed.

MILLEDGEVILLE, ILL.—The Milledgeville Telephone company has increased its capital stock from $10,000 to $18,000.

CADILLAC, MICH.—The Wexford County Independent Telephone company has increased its capital stock to $4,000.

CHEBOYGAN MICH.—The Cheboygan Telephone company has increased its capital stock from $30,000 to $70,000.

NELSON, NEBR.—The state railway commission has granted the Nuckolls County Independent Telephone company permission to issue $700 worth of stock for improvements and extensions.

HAZARD, KY.—The Perry County Telephone company has increased its capital stock from $5,000 to $8,000 for the purpose of making extensions and improvements.

YORK, NEBR.—The York County Telephone company has made application to the state railway commission for permission to issue $35,000 additional stock with which it intends to purchase a controlling interest in the Bradshaw Telephone company.

TAYLOR, N. D.—The capital stock of the local telephone company has been increased from $12,000 to $50,000.

WACO, TEX.—The Home Telephone company has changed its name to the Brazos Valley Telephone company and has increased its capital stock from $100,000 to $200,000.

MONROE, WIS.—The United Telephone company has increased its capital stock from $25,000 to $75,000.

MOSEL, WIS.—The capital stock of the Mosel and Centerville Telephone company has been increased from $15,000 to $25,000.

ABINGDON, ILL.—The Mutual Telephone Company has amended its charter increasing its capital stock from $15,000 to $40,000.

GALLIA, OHIO.—The Gallia Telephone Company has increased its capital stock from $50,000 to $125,000.

ROCKY MOUNT, W. VA.—The Franklin County Telephone Company has amended its charter increasing its capital stock from $7,000 to $12,000.

ROCKLAND, WIS.—The Rockland Telephone Company has filed an amendment increasing its capital stock from $1,200 to $6,000.

EDGAR, WIS.—The Edgar-Casset-Emmet Telephone Company has increased its capital stock from $1,500 to $4,000.

PRINCETON, WIS.—The capital stock of the Princeton Telephone Company has been increased from $5,000 to $8,000.

JOHNSTOWN, PA.—On June 6th the Johnstown Independent Telephone Company will vote on the proposition to increase the capital stock from $600,000 to $2,000,000.

CUTHBERT, GA.—Application has been filed with the state railroad commission for the approval of a bond issue of $50,000 contemplated by the Cotton Belt Telephone and Telegraph Company.

CARLINVILLE, ILL.—The Macoupin Telephone and Telegraph Company has filed with the county recorder a resolution authorizing an increase of the capital stock of the company from $10,000 to $50,000. The document provides that there shall be 500 shares of preferred stock and 500 shares of common stock. The preferred stock to bear 7 per cent per annum.

CHICAGO, ILL.—Judge Kohlsaat, in the United States Circuit Court, entered an order allowing the receivers of the Interstate Telephone and Telegraph Company to borrow $190,000 for improvement of its service and lines. It is now proposed to string 4,100 miles of new wires to Aurora, Bloomington, Joliet, Peoria, Decatur, Clinton, Iowa, and two lines to Springfield. The loan will be protected by a general mortgage through the Chicago Title and Trust Company.

ABINGDON, ILL.—The capital stock of the Mutual Union Telephone Company has been increased from $15,000 to $40,000.

LA PORTE, IND.—The La Porte Telephone Company recently increased its capital stock from $100,000 to $500,000.

DRY RIDGE, KY.—The Dry Ridge Telephone Company has increased its capital stock from $750 to $2,500.

CREECH, KY.—The capital stock of the Upper Cumberland River Telephone Company has been increased from $1,000 to $2,000 for the purpose of making improvements.

BREMEN, KY.—The Bremen Telephone Company has increased its capital stock to $8,000.

BUFFALO, N. Y.—The Federal Telephone and Telegraph Company has been authorized to issue $578,000 of 5 per cent bonds to purchase the Niagara Home Telephone Company, the Dunkirk Home Telephone Company and the Independent Union Telephone Company west of Syracuse.

CUTHBERT, GA.—The railroad commission has authorized the Cotton Belt Telephone Company to issue $50,000 worth of bonds with which to pay outstanding indebtedness and to make improvements.

GENEVA, OHIO.—The People's Telephone Company has increased its capital stock from $10,000 to $30,000.

LESLIE, ARK.—The exchange and all the connections of the Leslie Telephone Company and the local and long distance lines of the Reich telephone system have been purchased by A. L. Waterbury, who has also purchased the Searcy telephone system of Searcy.

PORT JEFFERSON, N. Y.—In order to make the desired improvements and also to install a telephone system at Smithtown, the directors of the North Shore Telephone Company have recommended that the capital stock of the company be increased to $25,000.

RUTHERFORDTON, N. C.—The Rutherfordton Telephone Company has increased its capital stock from $1,000 to $10,000.

CONNEAUT, OHIO—The Conneaut Telephone Company has filed an amendment increasing its capital stock $50,000, making a total of $100,000.

HAPPY, TEX.—The Happy Telephone Company has filed an amendment decreasing its capital stock from $5,000 to $3,750.

WHEELING, W. VA.—The receivers of the National Telephone Company have been granted permission to issue receivers' certificates to the amount of $15,000 for the purpose of redeeming an outstanding debt of $2,000 and to cover the cost of extensions and additions to be made to the system.

EDGAR, WIS.—An amendment has been filed by the Edgar Cassel-Emmett Telephone Company increasing its capital stock from $1,500 to $4,000.

RATES.

DECATUR, ALA.—Owing to the fact that the Southern Bell Telephone company announced that it would increase its rates, the city council passed an ordinance fixing the rates on telephones in Decatur and making it a fine of not less than $50 nor more than $100 for a telephone company to attempt to collect a higher rate than that fixed in the ordinance, which ranges from $1.00 to $2.50, the rate at present charged by the company.

ROCKFORD, MICH.—The farmers of this section are up in arms over the raise in rates by the Citizens' Telephone company. A mass meeting was held and a committee appointed to solicit names for an independent line.

VERMONTVILLE, MICH.—As a result of the increase of rates by the Citizens' Telephone company from $12 to $15 for residence telephones and from $15 to $18 for business telephones, subscribers in this place and vicinity threaten to discontinue the service and either patronize the Bell company or organize a new company.

MARSHALL, MICH.—According to the Giles bill, which was passed recently, stockholders, who have been getting a rate of $16 on business telephones and $9 on residence telephones, will now have to pay the regular rate of $24 and $15 respectively, except city party lines, which, together with lodges, churches and schools, have a $12 rate.

CANANDAIGUA, N. Y.—Beginning July 1st the Interlake Telephone company increased its rates to $24 for single-line business service; $18 for two-party line business service; $18 for single line residence service; $15 for two-party line residence service; $12 for four-party line residence service. An extra charge of $2.00 will be made for failure to pay in advance.

ALBION, N. Y.—The New York Telephone company, which recently absorbed the Albion Telephone company, has increased its rates from $12 to $15 on private residence telephones, and from $24 to $30 on business telephones. This raise affects over sixteen hundred patrons, who say they will discontinue the service at the increased rate. Appeal has been made to the Public Service Commission.

SALT LAKE CITY, UTAH.—Following the absorption of the Independent Telephone company by the Bell company, telephone rates all over the state, outside of Salt Lake City, will be readjusted. At Eureka the rates have been raised from $43 to $48 on two-party line business telephones and from $48 to $60 on single line telephones. No change is made in residence rates, which are $30, $24 and $18, according to the number of telephones on a line.

SEATTLE, WASH.—The Independent Telephone company of Seattle has petitioned the public service commission for permission to increase its rates. The testimony shows that the rates

are inadequate and the experts hired to investigate the matter recommend an increase. The proposed increase would net about $70,000 a year.

DECATUR, ALA.—The citizens of Decatur and New Decatur are protesting against the proposed advance of rates by the Southern Bell Telephone Company, which amounts to about 50 per cent of the present rate.

RUSHVILLE, IND.—At a meeting of the Rushville Co-operative Telephone Company for the purpose of considering an increase of rates for the purpose of making improvements, it was decided not to make the increase. A motion was unanimously carried that the directors be instructed to borrow the necessary amount to make the improvements.

PADUCAH, KY.—The East Tennessee Telephone Company has reduced its local rates from $1.50 and $2 per month to $1 per month.

WICHITA, KANS.—The Missouri and Kansas Telephone Company is seeking to increase its rates on private telephones from $1.50 to $2; four-party lines from $1 to $1.25; business, $3 to $4.

ROCHDALE, MASS.—The people of Rochdale object to the increase of the rate from this place to Worcester from 6 cents to 10 cents by the New England Telephone and Telegraph Company.

BOSTON, MASS.—Announcement is made of a general reduction in rates and considerable changes in service in every one of the exchanges of the New England Telephone and Telegraph Company in Massachusetts, outside the Boston and suburban districts, the same to take effect September 1. The reductions contemplated will approximate $200,000 throughout the state.

OWOSSO, MICH.—The Farmers' Co-operating Telephone Association formed to combat the Union Telephone Company because of its raise in telephone rates, has decided to let the matter rest until the state railroad commission takes over control of the telephone companies in August and to appeal to the commission to force the low rate.

NILES, MICH.—The subscribers of the Michigan State Telephone Company in this place have circulated a petition to the effect that telephones will be removed if the proposed increase in rates is made.

NEW YORK, N. Y.—A reduction of telephone rates between New York and Brooklyn from ten to five cents after August 1, and similar reduction between other parts of the greater city, have been ordered by the state public service commission, the most important decision affecting telephone companies rendered by the commission since it assumed control over a year ago.

ADA, OHIO—Because the Ada Telephone Company has increased its rates for country telephones from $1 to $1.25 the farmers have formed an organization for the construction of an independent line. Christian Helty is president of the organization.

MILWAUKEE, WIS.—The Wisconsin Telephone Company announces that the rate for extension telephones has been reduced from $9 to $7.50 a year; also that measured service will hereafter be computed on the basis of 1,000 calls at $50 a year instead of 800 calls at $48 a year.

DECATUR, ALA.—The Southern Bell Telephone Company of Decatur and the American Telegraph and Telephone Company of New Decatur have announced the rates on toll line and residence telephones will be increased about 50 per cent of the present rate, the same to take effect for old subscribers July 1. There is much opposition to this ruling.

RUSHVILLE, IND.—A meeting of the stockholders of the Rushville Co-operative Telephone Company will be held June 22d to decide whether or not the rates shall be increased.

WICHITA, KANS.—The Missouri and Kansas Telephone Company, through its vice-president, E. D. Nims, has notified the city commissioners that beginning June first the rates will be $4.00 for business telephones and $2.00 for residence telephones. per month. This is the schedule of rates in force January 1, 1911, and which were temporarily suspended pending investigations.

KANSAS CITY, MO.—An ordinance has passed the lower house of the council which provides a rate of $1.75 for residence telephones.

GRAND ISLAND, NEB.—The Nebraska Telephone Company has been granted permission by the state railway commission to reduce its rates in this city from $2.50 to $2.00 for individual residence telephones and from $2.00 to $1.50 for two-party line residence service, the same to take effect June 1.

MADISON, NEB.—The Madison Telephone Company and the Madison County Telephone Company, both operating exchanges in this place, have increased their rates. The rates of the former have been increased from $2.00 for business telephones to $2.50 per month; residence, from $1.00 to $1.50; farm lines from $1.00 to $1.50, while the rates of the latter have been increased from $1.50 to $2.50 for business; and $1.00 to $1.50 for residence and farm line telephones. This general increase in rates will be accompanied by physical connection of the two plants, which will virtually amount to a merger.

SARGENT, NEB.—The Crownover Telephone Company, which was granted permission in January last to increase its farm line switching rate from 25 to 40 cents, now desires the rate reduced to 25 cents again, stating that as a result of the increase the farmers threaten to install another exchange.

RAVENNA, NEB.—The Ravenna Telephone Company has been granted permission by the Nebraska State Railway Commission to increase the rate for residence telephones to $1.25 and business telephones to $1.75.

WACO TEXAS—The Home Telephone Company has been granted permission by the city commission to increase the rates on business telephones from $3 to $4 per month as soon as the number of telephones shall be increased over one-fifth of the present number.

MADISON, WIS.—The railroad commission has granted the application of the Argyle Telephone Company to increase its rates from $3 to $4.50 per telephone, per year.

MADISON, WIS.—The application of the Evansville Telephone Company for permission to increase rates was denied on the ground that the financial condition of the company shows that no general increase is needed.

FRANCHISES ASKED AND GRANTED.

NAPA, CAL.—W. M. Lyons has made application for a franchise for a period of fifty years to construct a telephone line along the public roads in Napa county.

UKIAH, CAL.—The Board of Supervisors has granted Hugh Coy and also the Willits and Laytonville Telephone and Telegraph company the right to construct and maintain rural telephone lines.

PETALUMA, CAL.—W. D. Thomas is seeking permission to install a rural telephone line from Marshall to Petaluma.

SHARBONA, ILL.—The Exchange Telephone company has been granted a franchise in this place.

ROCK ISLAND, ILL.—The Rock Island municipal commission has adopted an ordinance amending the franchise of the Central Union Telephone company, providing for a maximum rate suburban farmer line service, and the purchase of the Union Electric Telephone and Telegraph company's plant.

MT. ETNA, IND.—The Majenica Telephone company has been granted a franchise in this place.

WANN, KANS.—P. S. Troutman has a franchise to install a telephone system in this place.

HAMILTON, O.—The Hamilton Home Telephone company, through its manager, Frank Binkley, has made application to the Public Utilities Commission at Columbus to enter Cincinnati over the lines of the Bell Telephone company. The company is anxious to enter the city and claims the passage of the public utilities bill gives it this right.

SUFFOLK, VA.—The Atlantic Coast Telephone company has been granted permission by the Nansemond County Board of Supervisors to construct and maintain telephone lines along the county roads.

NAPA, CAL.—The Board of Supervisors have granted John A. Carbone a telephone franchise for the term of fifty years along the roads and highways of Napa county.

SUSANVILLE, CAL.—The Johnstonville Telephone Company has applied for a franchise to construct and maintain a telephone system in this place.

CORNING, CAL.—Jos. Tait, president of the Tehama County Telephone Company, has been granted a franchise in this city by the board of city trustees.

FRANKFORT, KY.—In an effort to secure an ordinance for the sale of a telephone franchise permitting rate of $1.65 for residence and $2.75 for business telephones, the East Tennessee Telephone Company succeeded in securing the sale, but the rates were fixed at $1.50 and $2.50 respectively until over 1,200 telephones are installed; then increase of 50 cents per 1,000 telephones is allowed. The passage of the ordinance means the retirement of the company from this city.

CLINTON, ILL.—The city council has granted Messrs. Cheadle and Sterrett of Joliet, a thirty-year telephone franchise.

ST. JOHNS, MICH.—The Clinton Telephone Company has been granted a franchise in this city.

GULFPORT, LA.—The Falk-McMahon Wireless Telegraph and Telephone Company, of New Orleans, is considering erecting

a station in this city if exclusive franchise rights can be secured.

Rochester, Minn.—The Rochester Telephone Company is seeking a new franchise. The present franchise does not expire for three years, but the company desires a new charter in order to improve its service, which will entail an expenditure of about $20,000 and the company does not feel justified in making this expenditure without the assurance that it will be granted a franchise for another ten years. J. Arthur Melone, president of the company, is asking for the franchise.

Crosby, Minn.—The Aitkin-Deerwood Telephone Company is seeking a franchise to install a central energy telephone system in this place. Application for franchises have also been received from the Blake Electrical Construction Company of this city and from H. Alexander of Park Rapids.

Denison, Texas—The Southwestern Telephone and Telegraph Company, through its general manager, J. E. Farnsworth, is seeking a franchise to operate a telephone system in this city.

Brigham City, Utah—At a recent meeting of the county commissioners a franchise was granted the Grouse Creek Telephone Company. The company intends connecting with the Bear River Valley Telephone Company's line at Trementon and as that company connects with the Rocky Mountain Bell, the people of the western part of the county will have connection with all parts of the state as well as neighboring states.

Corning, Cal.—The Tehama Telephone Company, through its representative, Joseph P. Taft, has been granted a franchise by the board of town trustees.

Evansville, Ind.—The Evansville Telephone Company, recently incorporated, has applied for a franchise in this city, in affiliation with independent lines in Kentucky.

Wann, Kans.—P. S. Troutman, who has a franchise to establish a telephone system at this place, is making arrangements to begin the work of installation.

Crosby, Minn.—The Aitkin-Deerwood Telephone Company of Aitkin has been granted a thirty-five year franchise in this place.

Shubuta, Miss.—The board of aldermen have granted the People's Telephone and Telegraph Company permission to enter this place.

Farmington, Utah—The county commissioners have granted the Home Telephone and Electric Company of Davis County a franchise to construct, maintain and operate a public telephone line and electric light and power system along the public highways in the county.

Ritzville, Wash.—The Washington Consolidated Telephone and Telegraph Company of Spokane has applied for a franchise to install a local telephone system.

CONSTRUCTION NOTES.

Little Rock, Ark.—The Southwestern Telegraph and Telephone company has appropriated $40,000 to build toll lines from Little Rock to Beebe and from Kensett to Eureka Springs. Officials of the company state that nowhere in the Southwest has rural telephone development been so great as in Arkansas.

Homer, Ill.—The Douglas County Telephone company will construct a line to Champaign via Sidney. A direct line is being built from this place to Danville.

Marion, Kans.—The Marion Mutual Telephone company contemplates constructing a line between Marion and Hillsboro in the near future.

Pikeville, Ky.—Thomas W. Kirk and others will install a telephone system in this place.

Bledsoe, Ky.—A telephone system will be installed in this place by J. W. Walker and others.

Ambrose, N. D.—Ambrose has been selected as the central exchange for the Divide County Farmers' Telephone company, which proposes to construct a telephone system that will cover every section of the county.

Conway, Ark.—The Conway Telephone Company contemplates the erection at an early date of a new exchange building in this city.

Pasadena, Cal.—A. B. Cass, president of the Home Telephone Company announces that his company will erect a power plant at a cost of $30,000 and will install about 300 telephones. South Pasadena will then be the distributing center for Pasadena, San Gabriel, Alhambra, Eagle Rock and part of Garvanzia.

Fort Wayne, Ind.—At a recent meeting of the directors of the Home Telephone Company it was decided to build an additional through toll circuit between this city and Warsaw, making two through circuits with a third circuit stopping at Columbia City.

Colquitt, Ga.—The Southern Bell Telephone Company will install an up-to-date system in this city.

Cottonwood, Idaho—At a meeting of the Mutual Telephone Company an appropriation was made for the construction of a line into the Joseph plains district, a rich agricultural and grazing section.

Aurora, Ill.—The Inter-State Telephone Company has authorized the expenditure of $125,000 in extensions and improvements. H. D. Wagner is president of the company and A. S. Clow secretary.

South Bend, Ind.—The Central Union Telephone Company will spend $20,000 in installing additional aerial cables in this city, and the new central exchange opened six months ago will be enlarged by increasing the switchboard capacity. The constantly increasing business demands that the improvements be made at once. Fred Bremer, superintendent of construction, will have charge of the work.

La Porte, Ind.—The La Porte Telephone Company has decided to erect a new exchange and office building and to install new equipment.

Des Moines, Iowa—C. E. Hall, assistant general superintendent of the Iowa Telephone Company, announces the company will install a thousand miles of new toll service in Iowa during the summer and will make extensive improvements in all parts of the state.

Lawrence, Mich.—A new telephone system will be installed in this place by the Lawrence Telephone Company, recently incorporated.

Duluth, Minn.—The Zenuth Telephone Company announces that it will erect a new central exchange on a site purchased by it some time ago at the corner of Second street and First avenue west. The building will be of pressed brick, thoroughly modern and up-to-date and will cost in the neighborhood of $50,000. The company contemplates the expenditure of something like $150,000 in extensions and improvements. A J. McCullough is general manager of the company.

Tacoma, Wash.—The Home Telephone Company of Puget Sound will install local systems and connecting lines for the following towns: Fleet, Coster, Clinton, Interlaken, Lakewood, Lake Grove, Lake City and others, at an estimated cost of $60,000.

Spokane, Wash.—Announcement is made by the Interstate Telephone Company that $170,000 will be expended during the summer in perfecting its long distance service to Lewiston, Idaho, and intervening cities and the installation of exchanges at Moscow, Palouse, Garfield, Oakesdale, Cohax, Rosalia, Tekoa and Waverly. One of the largest expenditures will be at Moscow, where an exchange and office building will be erected at an estimated cost of $75,000. Thaddeus S. Lane is president of the company.

MISCELLANEOUS.

Fordyce, Ark.—J. R. Hampton, H. C. Couch and J. H. Meek of Fordyce have purchased the telephone exchange at Prescott, owned by the Southwest Arkansas Telephone company and will improve and enlarge the plant in the near future.

Fordyce, Ark.—The Southern Telephone company has elected the following officers: President, A. B. Banks; secretary, H. A. Longino; vice-president, David A. Gates; treasurer, A. Amis; general manager, H. A. Couch. The company has been very successful in its operations, now owning 60 exchanges in Arkansas and Louisiana and several thousand miles of toll line.

Pine Bluff, Ark.—The Pine Bluff Telephone company has been purchased by the Southwestern Telegraph and Telephone company for a consideration of $50,000. It is stated that the two plants will be merged.

Conway, Ark.—The Conway Telephone company will erect a new exchange building.

Little Rock, Ark.—The Malvern Telephone plant and the Arkadelphia plant have been purchased by the Bell company, the former at a consideration of $19,500 and the latter for $28,000.

Conway, Ark.—The franchise, pole lines and equipment of the Conway Telephone company have been purchased by A. L. Waterman for a consideration of $25,000. The telephone systems at Morrilton, Searcy, Clarksville, Heber Springs, Leslie, Lonoke, Malvern, Arkadelphia and other places have been purchased by the same interests.

Fort Smith, Ark.—The Pan-American Telephone company has been purchased by a syndicate represented by Judge Ezra J. Morgan at a consideration of $100,000. The new owners will

thoroughly overhaul the system and install modern equipment, which will include a conduit system and a new switchboard.

MANSFIELD, ARK.—The Southwestern Telephone and Telegraph company will rebuild its plant at this place.

SAN DIEGO, CAL.—The Home Telephone company plans the expenditure of $35,000 in extending its service to Brooklyn Heights, Mission Hills and Inspiration Heights. It is the purpose of the company to extend its service to all outlying districts. The present company secured control of the system in 1909 and in 1910 $65,000 was expended in improvements. Horace R. Day is president of the company.

PETALUMA, CAL.—The Petaluma Rural Telephone company has elected the following directors: C. M. Winans, Geo. W. Gaston, S. L. Stice, C. Long, L. Whitlatch, E. P. Nisson, C. R. Denman, F. D. King and Geo. L. Robinson.

RED BLUFF, CAL.—The Tehama County Telephone company has elected the following officers: President, J. J. Worthington; vice-president, E. L. Sisson; secretary and treasurer, H. P. Andrews.

BOISE, IDAHO.—The Idaho Independent Telephone company has been purchased by the Rocky Mountain Bell Telephone company for $210,000. C. J. Sissel, secretary of the company, in an open letter to the stockholders, gives as the chief reasons for the failure of the company, that the business was in the hands of inexperienced men, that the rates, toll and rental were too low to keep pace with telephone development and meet the unexpectedly heavy depreciation of its property. The company had an investment of $400,000, but never paid dividends, with the exception of two small dividends which the secretary stated should not have been paid, as the company at no time had money for dividend purposes.

FIELDON, ILL.—The Fieldon Telephone company has been purchased by a stock company formed of the following business men of Fieldon: Frank Rowden, Phillip Taylor, Fred W. Decker, F. W. Haushalter, George Taylor, Clem Groppell, Charles Goetten, F. J. Walz, John Becker, L. A. Albert, Joseph Schmeider, Louis J. Krueger, Leo H. Beiermann. The officers of the company are as follows: President, Charles Goetten; vice-president, Clem Groppell; secretary, Fred W. Decker; treasurer, Leo. H. Beiermann.

DEKALB, ILL.—The DeKalb County Telephone company will erect a new exchange building.

ROSEVILLE, ILL.—The Roseville Telephone company has elected the following officers: President, Nery Kirkpatrick; vice-president, Allen Adkinson; secretary-treasurer, W. J. McQuiston, Monmouth; manager, Walter Waugh.

INDIANOLA, ILL.—The Vermilion Grove Telephone company, which was recently sold at receiver's sale, was purchased by Josephus Hollingsworth of Vermilion Grove.

SADORUS, ILL.—The Sadorus Telephone exchange has elected officers as follows: President, E. B. DeLong; treasurer, A. G. Lewis; secretary, Ira Craw; manager, Henry Nale.

MONMOUTH, ILL.—The following officers have been elected by the Monmouth Telephone company: President, C. C. McClung; vice-president, F. B. Pattee; secretary-manager, W. J. McQuiston. The reports showed the company to be in excellent condition. There is a total of 2,100 subscribers.

WYOMING, ILL.—The Stark County Telephone company has taken over the Duncan Telephone company, giving the former company a total of 1,600 telephones with exchanges at Wyoming, Toulon, Elmira, Camp Grove, Castleton and Duncan.

MCLEAN, ILL.—The Palmer-Darnell Telephone company, with headquarters at this place and having exchanges at Atlanta and Armington, has been purchased by J. H. Baker of McLean and B. F. Baker of Leroy. For the past nine years the company has been under the efficient management of Charles W. Welch, who will continue in this position.

CORYDON, IA.—A deal has been consummated whereby the Hawkeye Telephone company has taken over the Wayne County Telephone company.

GRINNELL, IA.—The Interior Telephone company is planning extensive improvements in its system, including a new central office building.

CLINTON, IA.—At the annual meeting of the Tri-City Automatic Telephone company the following officers were elected: President and general manager, A. G. Hawley; secretary and treasurer, C. B. Cheadle; local manager, R. M. Matteson.

CUMBERLAND, LA.—The local telephone exchange is to be remodeled and a new switchboard installed at an estimated cost of $75,000.

KEOKUK, IA.—A deed conveying the local property of the Mississippi Valley Telephone company to the Iowa Telephone company has been filed with the recorder. The company also operates exchanges at Montrose, Fort Madison, Wever, Burlington, Mediapolis, Wapello, Columbus Junction, Grand View and Muscatine.

JONESBORO, LA.—The Southern Telephone company will reconstruct its plant in this city.

CUMBERLAND, MD.—The Chesapeake and Potomac Telephone company and the Western Maryland Telephone company will be consolidated. According to the terms of consolidation, the stockholders of the Western Maryland company will receive $80,000 for their stock and the Chesapeake and Potomac company will assume the bonded indebtedness of $165,000. The Western Maryland operates 2,700 or 2,800 telephones in Cumberland and Allegany counties, while the Chesapeake and Potomac subscribers have independent telephones also, and it is claimed that by the merger there will be a saving of from $12,000 to $15,000 a year. The company proposes to begin shortly the construction of a conduit system and a new fireproof exchange building will be erected and a multiple switchboard of 10,000 lines capacity installed. The Public Service Commission of Maryland had approved the merger. The Chesapeake and Potomac company agrees to consolidate the two systems within 60 days after stock is acquired.

GRAND RAPIDS, MICH.—The Citizens' Telephone company recently celebrated its fifteenth anniversary by declaring the fifty-sixth quarterly dividend of 2 per cent. Reports showed the past year to have been the most successful year in the history of the company and also that the company is stronger financially than it has ever been. It begins its sixteenth year with a list of 11,350 subscribers.

GRAND RAPIDS, MICH.—As a result of the adoption of the policy of centralized management by the Michigan State Telephone company there have been a number of promotions among its employes. Arthur Von Schlegel, general contract agent of the company, becomes general commercial superintendent of Michigan, Wisconsin, Indiana, Ohio and Illinois; B. W. Trafford, general manager, becomes vice-president of these states; C. E. Wilde, division manager of the Grand Rapids district, is commercial manager for the western half of Michigan; E. P. Platte, local manager of the Grand Rapids local office, becomes plant manager for the territory from the straits of Mackinaw to the Indiana line; George Welsh, formerly division contract agent of the Detroit division, will be commercial superintendent of Michigan; George R. Heywood, for nearly three years in charge of the contract department in this city, becomes general agent for the state, and John D. Hess, formerly special agent at Detroit, becomes head of the commercial department connected with the Grand Rapids office.

MINNEAPOLIS, MINN.—Negotiations are said to be pending for the purchase of the Duluth Telephone company, capitalized at $1,000,000, by the Northwestern Telephone Exchange company of this city.

HUMANSVILLE, MO.—The Humansville Telephone exchange, formerly owned by Cordz and Son, has been purchased by Likens Brothers of Springfield for a consideration of $32,000.

OMAHA, NEB.—A new fireproof office building will be erected on Douglas street between Eighteenth and Nineteenth streets by the Nebraska Telephone company at a cost of $60,000.

WYMORE, NEB.—The business men of Wymore have decided they will use but one telephone line. The company receiving the majority of votes will be the one retained.

BUFFALO, N. Y.—Negotiations have just been concluded whereby the Federal Telephone and Telegraph company has purchased the property of the Independent Union Telephone company of New York and Pennsylvania. The property includes about 300 miles of long-distance cables and a score of exchanges and the transaction involves upwards of $1,000,000.

DUNDEE, N. Y.—The Dundee Telephone and Telegraph company has elected the following officers: President, Silas A. Price; vice-president, Dr. Albert J. Price; secretary and treasurer, Floyd J. Price.

BUFFALO, N. Y.—The Federal Telephone and Telegraph company has acquired the controlling interest in the Rochester Telephone company, the Niagara County Home Telephone company and the Independent Union Telephone company. The transaction is said to involve upwards of $1,000,000 and adds to the equipment of the Federal company which controls the Frontier telephones of this city, about 25,000 telephones in Western New York and the northern edge of Pennsylvania, some 300 miles of long-distance wires, and more than a score of exchanges.

CLEVELAND, O.—The reorganization of the United States Telephone company has been effected by the election of Frank A. Davis of Columbus as president and G. R. Johnston, Columbus, general manager of the company, and William F. Burdell, also

of Columbus, as directors. Messrs. Johnston and Burdell were chosen to fill the places of Clarence Brown of Toledo and Herman Stifel of St. Louis. All other officers of the company were re-elected.

Dolgeville, N. Y.—The Utica Fire Alarm Telephone and Telegraph company has been awarded the contract for installing the new firm alarm system in that place.

Napoleon, O.—The Napoleon Home Telephone company was recently sold at receiver's sale to W. L. Parmenter, Lima, for $21,100.

Klamath Falls, Ore.—The Pacific Telephone and Telegraph company will extend and improve its system in this city, making it modern and thoroughly up to date.

Shickshinny, Pa.—The Luzerne and Columbia Counties Telephone company has been purchased by the Farmers' Supply and Telephone company for a consideration of $7,000. The two companies will be consolidated.

Oil City, Pa.—W. C. Paca, general manager of the Petroleum Telephone company, announces his company will put in over 40,000 feet of underground conduit in the streets of this city. The extensions will involve an expenditure of about $12,000.

Reitz, Pa.—The Central Telephone company has elected the following officers: President, Prof. A. I. Mock; vice-president, J. M. Wagner; secretary, Washington Custer; treasurer, J. C. Lambert.

Bristol, Tenn.—District Manager J. J. Veatch, of the East Tennessee Telephone company, announces the purchase by his company of the exchanges at Mountain City and Butler.

Alpine, Tex.—W. Durritt of San Marcos has purchased the Alpine telephone exchange with all outlying lines. The price paid was $18,000. It is the purpose to purchase all the independent lines in this section, and consolidate them into one perfect system.

Ferndale, Wash.—The Merchants' Telephone company's system and the Farmers' Mutual telephone system have been consolidated, the former being absorbed by the latter.

Clinton, Wis.—At the annual meeting of the stockholders of the Clinton Telephone company the following officers were elected: President, O. L. Woodward; secretary, C. W. Coliver; treasurer, H. A. Moehlenpah.

Oklamoma City, Okla.—Announcement has been made of the consolidation of the executive positions of the Pioneer, the Missouri and Kansas and the Bell Telephone Company of Missouri. Charles S. Gleed, of Kansas City, head of the companies operating in Missouri and Kansas, is made president of the Pioneer Company, succeeding E. D. Nims, who is made vice-president of the Pioneer and the Missouri and Kansas companies. The Oklahoma property will be under the direct management of John M. Nohle, vice-president and general manager, while Nims will go to Kansas City. The consolidation places property approximately worth $40,000,000 under one head.

Colorado, Tex.—The Texas and Pacific Telephone Company has sold its exchange in this city to the Southewestern Telephone Company, but retains all long distance lines.

Sacul, Tex.—The Sacul telephone exchange has been purchased by J. W. Pye, who will improve the same.

Salt Lake City, Utah.—At a meeting of the directors of Utah Independent Telephone Company the company was declared insolvent and the company's holdings have been ordered to be sold at public auction.

Birmingham, Ala.—The People's Telephone Company has been taken over by local interests and it is the purpose of the new owners to at once enlarge the plant. The directors of the new company are as follows: A. L. Fulenwider, president; E. G. McConnell, vice-president and general manager; M. L. Badham, L. Sevier, Frank H. Crockard, J. W. McQueen, James Bowren, Eugene L. Brown, Ross I. Smith, Louis Saks Hubert, A. Dreneen, Sol Caheen, E. B. Fowlkes, Sid W. Lee, Robert Fulenwiler, W. A. Porter, George M. Morrow, W. H. Kettig, T. W. O'Byrne, C. T. Fairbairn, W. W. Crawford, W. H. Hassinger, E. G. Chandler, all of Birmingham, and A. E. Adams and H. H. Stambaugh of Youngstown, Ohio, and Dr. W. T. Taylor of Bessemer, Ala.

New Westminster, B. C., Can.—Geo. H. Hales, secretary of the British Columbia Telephone Company, announces that a new central energy system will be installed in Westminster during the next year.

San Francisco, Cal.—It has been announced that the Postal Telegraph Company will enter the telephone field. Experiments were recently made on its lines between Salt Lake City and Reno, Nev. Its trunk telegraph lines between Reno and San Francisco are to be used for telephone messages between those cities. When the experiments were made the wires were being used for transmitting telegraphic messages between Chicago and San Francisco. Four operators were at work, two in each direction, yet parties in Salt Lake City and San Francisco were in conversation with parties in Reno, talking through the telegraphic messages. When the new power plant now in construction at Reno is completed service will be established between Salt Lake City and San Francisco.

Denver, Colo.—A meeting of the stockholders of the Colorado Telephone Company will be held July 17 to approve a proposition to consolidate that company with the Tri-State Company. The Tri-State Company was organized two years ago to operate the various Bell systems in New Mexico, Arizona and Western Texas. It is capitalized for $1,000,000.

Rush, Colo.—J. H. Hart, a ranchman of this place, is interested in the erection of a telephone line connecting the ranches in the eastern part of Colorado with Colorado Springs. The ranchmen plan to begin its construction in the fall.

Juliaetta, Idaho—At the annual meeting of the Fix Ridge and Juliaetta Co-operative Telephone Company the following officers were elected: President, W. A. Borne; secretary, J. C. Groseclose; treasurer, O. H. Niles.

Wallace, Idaho—Geo. R. Bloomer, manager of the North Idaho Telephone Company, announces that his company will construct a line between Murray and Nelson.

Quincy, Ill.—The Central Union Telephone Company will rebuild its system in this city at an estimated cost of $300,000.

Clinton, Ill.—The National Telephone Company is making arrangements to install a new telephone system in Clinton and Dewitt counties. B. F. Wasson is head of the company.

Attica, Ind.—The Attica telephone system has been purchased by John T. Detchon of New Richmond for a consideration of $25,000. The purchase also includes an interest in nine toll lines. Mr. Detchon also owns telephone lines in Greentown, Ind., and Toledo and Greenup, Ill.

Gas City, Ind.—The Gas City Independent Telephone Company and also the Jonesboro independent system have been purchased by the Central Union Telephone Company.

Columbus, Ind.—The Citizens' Telephone Company has elected the following officers: President, William Fortune, Indianapolis; secretary and treasurer, Charles S. Norton, Indianapolis; manager, John L. Hosea, Columbus.

Lafayette, Ind.—The property and equipment of the Sterling Electric Works have been purchased by the Lafayette Electric and Manufacturing Company. The new company will engage in the manufacture of telephones and other electric supplies on an extensive scale.

South Bend, Ind.—The Central Union Telephone Company is preparing to enlarge its exchange opened in this city some months ago.

Pleasantville, Iowa—The Knoxville Electric Company is planning extensive improvements in its local system.

Davenport, Iowa—Plans are being prepared and bids will soon be asked for the new building to be erected in this place by the Iowa Telephone Company. It will be of the most modern construction throughout and will be absolutely fireproof.

Mason City, Iowa—The Western Electric Telephone Company of this city has purchased the Kossuth County Telephone Company and the Clarion and Northwestern Company, at a combined cost of $54,000.

Shelbina, Mo.—W. W. Tracy of this city has purchased the telephone exchanges at Oregon and Forest City; also at Laclede.

Red Wing, Minn.—The Goodhue Telephone system has been purchased by the Northwestern Telephone Company at a consideration of $25,000.

Butte, Mont.—At the annual meeting of the stockholders of the Montana Independent Telephone Company the following directors were elected: C. J. Kelly, C. F. Kelly, I. O. Evans, H. A. Gallwey, T. S. Lane, Patrick Wall, C. S. Jackman, John Mac Ginniss, A. B. Cook, J. J. Flanigan, G. E. Blackburn, John E. Davies and W. H. Hall. The report of President T. S. Lane showed that the number of telephones increased 2,095 during the year. The gross earnings were $218,998; expense of operating, $97,996; fixed charges, $80,646; net earnings, $40,353 for the year. The net earnings over fixed charges in April were $5,137.

Trumbull, Nebr.—The Farmers' Telephone Company will erect a central office building.

Bonesteel, Nebr.—The Krotter telephone system at this place has been purchased by the Nebraska Telephone Company.

Batavia, Ohio.—A contract has been granted J. L. H. Barr of this city by the Cincinnati Bell Telephone Company for the erection of an exchange building in this city.